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ABSTRACT

This collection of 21 papers delivered by university professors and other representatives from throughout the United States focuses on economics teaching in the classroom from a variety of perspectives. The papers include: (1) "Internationalizing the Curriculum: The United States in a Global Economy: International Issues for the Beginning Student" (R. Adkins); (2) "Spreadsheets in the Electronic Economics Classroom: An Experiment in New Technology" (H. Booker); (3) "Microeconomics with Microcomputers: Graphing the AH-HA" (Q. Ciolfi); (4) "Applying TQM in the Classroom" (G. Cole); (5) "A Beverage Industry Case Study Approach to Introductory Economics" (M. Connell); (6) "Improving Economics Instruction in the First Course: Teach Economics as a Second Language" (R. Crowe); (7) "Developing a Tool for Measuring Teacher Effectiveness" (V. Free); (8) "The Impact of Mandatory Attendance on Student Performance" (G. Gerstner); (9) "Microeconomics and Total Quality Management" (B. Greenberg); (10) "Designing Controversy: Enhancing Higher Order Thinking about Economics and Social Work" (N. Hampton; B. Stadum); (11) "Designing Multiple Choice Tests" (R. Hansen; J. Gleason); (12) "Teaching Economics Via Satellite" (B. Harik); (13) "Action Research Groups as a Student Learning Tool" (J. Ilacqua); (14) "A Computer-Based Research Project for an Undergraduate Course in Development Economics: Discussion and Evaluation" (L. Kinney; E. Adams); (15) "Maximizing Output in the Economics Classroom: Integrating Necessary Skills" (L. Manning); (16) "Student Uses of Personal Computers in Teaching Economics" (M. Moini); (17) "Teaching Economics: Some Information from the Marketplace" (D. Oyen; E. Young); (18) "Using the COMPENSTAT Assignment Generator" (W. Sanders); (19) "The Impact of Two Curricular Changes on Student Achievement in Economic Principles: Some Evidence from an Open Admissions University" (T. Schibik; S. Cox; M. Khayum); (20) "Total Quality Management in the Classroom: A Production Experiment" (M. Tansey); and (21) "How Market Demand Determines Market Supply: A Computer-Animated Illustration" (A. Wilkins; D. Thompson). (EH)

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Fifth Annual

Teaching Economics Conference

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Fifth Annual
Teaching Economics Conference

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February 10-12, 1994

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Introduction

I wish to express our appreciation to all of the attendants and presenters at the 1994 Teaching Economics Conference co-sponsored by McGraw Hill Publishing and Robert Morris College. Without your interest and effort the conference would not happen.

In particular I thank those who have submitted their papers for inclusion in this volume of Papers and Proceedings. The conference committee believes it is important to provide a record of the conference. In addition to the papers this volume includes the list of participants and presenters at the conference.

I thank those who submitted papers for meeting the request for both printed and computer disk copies of their work. There were problems reading some of the computer disks. Due to these technical problems some of the papers were computer scanned. Some tables and charts had to be copied from the author's printed submission. I apologize for any degradation of the quality of the copy due to these problems.

The conference committee expresses its appreciation to McGraw Hill for its continued support. The committee is grateful to Robert Morris College for its backing of the conference. Our thanks also to the staff of the Center for Leadership for their excellent support and attention to our needs.

Bobby G. Dudley, Editor

RMC Teaching Economics Conference

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Internationalizing The Curriculum

The United States In A Global Economy: International Issues For The Beginning Student

Roger L. Adkins
Marshall University

This course was developed in response to a very practical problem - a small number of departmental majors and sharply declining enrollments within the College of Business (COB) where the Economics Department is administratively housed. Also, the University has been promoting the need to bring more of an international focus to the campus. In the past, large enrollments in the COB kept the faculty busy teaching a six-hour principles of economics sequence (two-thirds of all courses offered). Thus, to soften the reduction in student credit hours and to attract more students to the major as they entered the university, we designed a freshman level course which we feel not only meets our needs but is valuable to students at the same time. "The United States in a Global Economy" (a freshman level course) obviously has an international theme; however, the course integrates two additional and related topics. First, some diversity issues are treated through discussions of both legal and illegal immigration and a discussion of the success of immigrant groups relative to African-Americans. Secondly, environmental questions are treated where international dimensions are present (acid rain, rainforests, fishing rights and so on).

As noted above, the Department of Economics has sought to maintain its student credit hour production which will maintain the number of positions in the Department (nine) and, in turn, allow the opportunity to offer a wide variety of upper-level courses to sustain a viable major. However, we strongly believe that the course being reviewed has a high value added for most of our students. Marshall University is an urban institution of approximately 12,000 students located on the Ohio River, with nearly 90 percent of our students are from West Virginia. Of these, a very large percentage are drawn from the coalfields of Southern West Virginia which are located in the heart of Appalachia. Thus, the students bring a set of fairly parochial attitudes with them from their homes and communities. This course has been designed in part to challenge those attitudes.

Philosophy of Course

If I had to summarize in a few words what this course was about, I would state that "The purpose of The United States in a Global Economy," is to initiate the development of proficiencies which students will need during and after their college careers while using economics as the vehicle to achieve these proficiencies while, at the same time, developing a global awareness. Thus, gaining an understanding of economics does not constitute the primary aim of the course. Most students who are enrolled in this8 class will not take additional coursework in the discipline, and, without repetition, they will retain little of the specific information conveyed regarding economic principles. On the other hand, the ability to gather information, communicate that information both in written and oral form, and build teamwork skills will aid life-long learning and labor force success. Better understanding of and curiosity about the world is viewed as a useful by-product of this experience.

This approach represents a developing philosophy among many of the faculty. As a department, we are more and more moving toward the position that our function is not to train our students for entry into graduate programs should they choose; rather, our emphasis has been shifting toward building proficiencies in the manner suggested by Hansen. (See References.) The following description of this course and assignments will be better understood with the instructor/department philosophy described above.

Course Overview

Required Reading:

1.The Economist (available at student discount).
2.Harrison, Lawrence E. Who Prospers: How Cultural Values Shape Economic and Political Success. New York: Basic Books, 1992.

Writing Assignments

1.The student selects a country of interest. By the end of the third week they turn in a one-page report (attachment A). This first report serves to get them to the library and to make a general comparison between their country of study and the U.S. When these papers are turned in, a period is given to a discussion of similarities and differences among countries selected. Those students who have selected Third World countries offer very lively commentary on the great differences between their country and the United States. Next, they write a five to seven page "briefing paper" on major social, political, economic, and military (if applicable) developments from 1945 to approximately the 1985-90 period. After this paper is completed, a second five page paper is written summarizing current and potential problems in the same country. Both papers are returned to students with suggestions for improvement. If left alone, most students will select a European country or one settled by Europeans. I generally restrict one student to a country and in turn limit the number of countries within a region. This provides a broad coverage of nations form all areas of the world.

2.Two "position papers" are required. These papers are of no more than two pages on a current problem. The student is asked to consult several readings other than class materials and take either a pro or con position on the issue. A period is set aside for class discussion of the issue.

A typical topic: "Legal and illegal immigration has positive benefits for the United States."

Oral Assignments

1.Each student must give a two to three minute summary of a major point of interest in their research. They are encouraged not to summarize the paper--just talk about something they found intriguing or unusual. This occurs after the second and third papers in assignment one above are submitted.

2.Students are randomly called upon to summarize assigned reading material in The Economist.

Group Assignment

I divide students into as diverse groups as possible (four to five students each). I then give them a group of international statistics such as "Deaths of Children Under Five Per 1000 Live Births," "Annual Beef Consumption, Pounds Per Capital, 1988-90," and so on. I ask each group to place the position of the U.S. on that list along with Japan and at least four or five other countries of interest.

This exercise provides entertainment in addition to allowing the student to see that in many instances the U.S. ranks high in some category that is not desirable to do so and vice versa. After several weeks of this contest they gain new insight into how societies have different values which influence the allocation of resources. On an evaluation form where this activity is reviewed, a few students are critical of the exercise because they feel the U.S. has too many areas of unfavorable comparison. I continue this exercise for that very reason.

Additional Teaching Resources

1.International faculty and students are used wherever possible to provide a greater international dimension. Students must pose questions about the history, politics, and culture of the guest's country.

2.Video tapes on the European Community, Global Assembly Line, and similar global issues are used throughout the course.

3.A wide variety of opportunities are made available as extra credit which expose students to international issues and other cultures.

Valuable Teaching Tip

While attending a conference during the past year, a comment from a participant got me to thinking about how to reduce student inhibitions with respect to speaking in class. I have used a first session cocktail party which has been very successful.

On the first day, I arrive at the classroom before the students and set up refreshments. As each student enters, they put their name on a stick-on tag. They are not allowed to sit down and must partake of the refreshments and mix with other students. This goes on for one-half hour to forty-five minutes. I take about five minutes at the end to make brief comments about the course. The barriers come down and is well worth the lost session if class participation is your goal.

References

Hansen, W. Lee. "What Knowledge Is Most Worth Knowing - For Economics Majors?" AEA Papers and Proceedings 76 (May 1986): 149-52.

Attachment A
Sample Student Paper
Nicole Lester, Economics 150, Spring 1994

	France	United States
HDI Rank	8	6
Life Expectancy	76.4	75.9
Adult Literacy(%)	99.0	99.0
Mean Years of School	11.6	12.3
Real GDP(Per capita)	17,405	21,449
Human Development Index	.971	.976
Maternal Mortality Rate Per 100,000 births	13	13
Population Per Doctor	320	419
Televisions Per 1,000 People	406	815
Unemployment(%)	9.4	6.6
Suicides Per 100,000 People	21	13
Rapes Per 100,000 People age 15-59	17	118
Single-Parent Homes(%)	5	8
Divorces(% of Marriages Contracted)	31	48
Live births Outside of Marriage(%)	26	27
Intentional Homicides Per 100,000 People	4.6	8.0
Number of New AIDS Cases Per 100,000 People	6.6	15.6
Population Eligible for Public Health Insurance(%)	98	25
Telephones Per 100,000 People	608	789
Passenger Cars Per 100,000 People	417	588
Percent of Labor Force in Agriculture	7	3
Percent of Labor Force in Industry	20	26
Percent of Labor Force in Services	73	71
Export/Import Ratio	90	72
Military Expenditure(as % of GDP)	3.6	5.6
Urban Population % of Total	1960 1991 2000	1960 1991 2000
	62 74 77	70 75 77
Estimated Population(millions)	1960 1991 2000	1960 1991 2000
	45.7 57.0 58.8	180.7 252.5 275.3
Contraceptive Prevalence Rate(%)	81	74
Armed Forces Percent of Total Population(1987)	0.98	0.89
Military Expenditure(% of GDP)	1960 1990	1960 1990
	6.3 3.6	8.8 5.6

Spreadsheets In The Electronic Economics Classroom: An Experiment In New Technology

H. Marshall Booker
Christopher Newport University

Abstract

In a pilot study conducted under a grant from the State Council of Higher Education in Virginia, prototype classroom communications systems were used to introduce the use of the computer in Principles of Economics Classes. The classes were limited in size to a maximum of 28 students because of the number of computer terminals networked in a specialized electronics classroom setting.

In the electronic classroom each student has the use of a terminal networked to a unified server so that the instructor can prepare homework and projects for use in the classroom setting and students through the use of Lotus 123, WordPerfect, and dBaseIII Plus can use spread sheets, data bases and graphical analysis instantaneously in the classroom during instruction periods gaining immediate internet feedback.

This paper demonstrates the system, discusses and analyzes the results of their use in the classroom and includes a discussion of student response to the use of the computer in the classroom. Since the instructor taught two comparable sized sections of principles during the same semester, one taught using computers in the classroom, and the other using traditional lecture/workbook methodology, the project allows an analysis of student evaluations, anxieties, expectations and outcomes across the two sections.

Introduction

It is well documented in educational literature that the increased use of microcomputers in schools, colleges and universities has had a dramatic and positive impact on learning and retention. Through a grant from the State Council for Higher Education in Virginia (SCHEV) Christopher Newport University has been able to accelerate the introduction of the microcomputer in several of its classes. During the past two academic years, Professor Booker used the newly constructed ELECTRONIC CLASSROOM at CNU designed to allow each of thirty students continuous hands-on use of a microcomputer during class time. The purpose of this article is to describe the design, use, and evaluation of this system.

Section I: The Electronic Classroom

Gosnold Hall G-123 has been designed exclusively for the use of the personal computer in the classroom instructional setting. There are thirty personal computers interlinked with a server in the classroom. Since several different University classes use this facility every hour of the day with the exception of designated preventative maintenance hours each day, several software packages have been loaded onto the system for use by the students and instructors. These include, but are not limited to WordStar 3.2, WordPerfect 5.0 and 5.1, Lotus 1-2-3, dBaseIII Plus, Framework, Harvard Graphics and Fiscal.

Since it has proven unlikely that every terminal in the classroom will be "up and running" every hour of every day, enrollment in Economics 201-202 scheduled for G-123 was intentionally limited to 28 students. Before introducing the students to the use of the computer and economics applications in particular, a considerable amount of testing was done regarding student attitudes and feelings toward courses and learning styles in addition to especially developed pre-tests of economic and computer knowledge. For example, a questionnaire was administered regarding Student Learning Styles using the system developed by Anthony F. Crasha and Sheryl Riechmann at the University of Cincinnati. Students were classified as either

a) Independent
b) Avoidant
c) Collaborative
d) Dependent
e) Competitive
f) Participant

The questionnaire results indicated that eighty percent of the respondents were classified as either Competitive or Participant. Competitive response style is exhibited by those motivated to learn through competition with others in their classes. Grades, rewards, the classroom experience, attention, are all seen as important win/lose situations and competitive students of course want to win. On the other hand, Participant students are just slightly more driven and feel class attendance is of vital importance as is participation in class. They like a highly structured class as do the Competitive students and want to take part in as much of the class experience in and out of class as possible. Since this was a highly structured intensive class setting it was indeed opportune that so many of the students were at this end of the spectrum as opposed to being classified as Independent where students preferred to work on their own with little or no formal direct instruction.

It is also important to recognize that only five of the students had had any introduction to computers at this point in their career path. None of those in the class were familiar with either Lotus 1-2-3 or dBaseIII Plus. Only three students had had any experience with WordPerfect. An economics pre-test designed by Dr. Booker was administered to all students in the section the first day of class. The test consisted of twenty multiple choice questions testing knowledge of basic economic concepts and terms such as (a) private enterprise, (b) capitalism, (c) debt and deficit, (d) money and banking, (e) taxes, (f) opportunity costs, and (g) real income and real wages to name a few. A range was established according to the following scale.

Table I: Pre-test of Basic Economic Concept Understanding - "Electronic Classroom"

Number Correct	Score	Percent in This Group
18 - 20	Excellent	8
16 - 17	Very Good	12
12 - 15	Good	28
11 or less	Needs Improvement	52

The class was structured to meet for three 50-minute class periods per week (MWF sequence). The first four class meetings were used to instruct the students in basic keyboarding and computer hardware usage generally. In addition students were given a survival course in WordPerfect 5.1 and Lotus 1-2-3 including the use of Printgraph in Lotus 1-2-3. Of special importance was the use of the Lotus spreadsheet and the construction of data bases in that spreadsheet. Vital instruction was also given to students in the development of formula construction within the spreadsheet so that students could quickly see and analyze average and marginal analysis concepts. Even though Lotus was the spreadsheet vehicle of choice, numerous others are available for use in the classroom. They all have the advantage of being very user friendly, flexible, and facilitate quick development of basic adequate skills of usability.

Section II: Data Base, Spreadsheet and Graphic Approaches

Each student was given a special codename and Student I.D. Number which allowed them to sign on the computer system in G-123. The system was also designed to provide log-in time and time of use-information for the instructor. The students first introduction to the use of the computer involved the collection of data into a Lotus spreadsheet to be used to construct a first attempt production possibilities curve (Transformation Curve). Data on several alternative choices among traditional Samuelsonian Guns and Butter opportunities were placed in the data bank along with data on the distribution of receipts and expenditures at the national level. Current data was used from the most recent issue of the Economic Report of the President.

Through the use of transparencies and an overhead projector, computer projection screen system and considerable verbal instruction students were given a "cookbook" menu through which they could each retrieve data into the spreadsheet, organize it and save it to be used to develop graphic presentations. Immediately the students wished to move to Printgraph in the Lotus program so they could see the results of their inputs. Following instruction by the professor each student was able to retrieve their data and construct a possibilities curve on their screen, in color no less. The excitement at seeing economics "come alive" on their PC screens showed in their vocal and facial expression. Only a few became frustrated at the "system" but soon overcame their sense of loss as those around them assisted the instructor in the correcting of entry errors. Students were then given written and verbal instruction on the various capabilities of Printgraph and how to translate their data banks and screens into a hardcopy.

This process continued throughout the semester with in-class work and homework assignments being placed on the system ahead of time for the students to retrieve, massage, analyze, and display. As students became more familiar with both the hardware and software they were using and more precise data was at their disposal they became more intrigued with the format and its capabilities. For example, there seemed to be something magical about using the system to plot demand and supply curves, find equilibrium conditions and then shift demand and/or supply curves to examine new equilibrium sets. To see it on the page in the book or on the board is one thing. To actually create it from a data base and see it on the screen with a few simple keystrokes seemed to make learning fun, almost Atari-istic/Nintendo-istic.

The class moved quickly and easily through the rigors of model building, theory, and application. They seemed to look forward to the next section even to the point of asking the instructor to put data on the server ahead of the scheduled lecture. The use of the spreadsheet became invaluable in the teaching of production and cost analysis. Not only did the stages of production become clearer to the students, but the link between production, costs, and output/price decisions became welded. Spreadsheet analysis incorporated virtually all aspects of production analysis including both fixed and variable factors of production, total, average and marginal physical product, and the elasticity coefficients of the production functions used. The transition from production to cost becomes easily solved with the assignment of prices to the various factors of production. Through the spreadsheet approach the full range of costs of production can be explained and comprehended more easily since the student must learn to develop the cell formulas that will calculate average, marginal costs, etc. Beyond this, students then moved more easily into the profit maximization, minimum loss model using the same data on their Lotus Worksheets.

The most important use of the spreadsheet comes in the understanding of the formulas that need to be processed into the spreadsheet cells to calculate the various production and/or cost curves. Since the student is making and watching the calculations the relationships become more readily understood. "What if this happens" questions and problems were put into the system by the instructor, changing factor prices, market demand conditions, etc. Students were allowed to work alone or collaboratively on the homework which could either be turned in by hardcopy, disk, or left in the system for review.

Section III: Traditional Class

The instructor was fortunate to have taught another "regular" section of Principles in the year being evaluated to be used as a control group to make comparisons of learning styles and experiences between the two groups. Interestingly enough, the traditional principles class had a profile not unlike that of the Computer Assisted Class in terms of learning styles, prior knowledge of economics and expectations for the course. Seventy five percent were classified as either Competitive or Participant. Surprising though, was that a higher number of students (10 of 30) had some experience with a computer at the high school or college level before entering this class in which the computer was not available. Six of these students had a working knowledge of WordPerfect and/or Lotus 123, but none had any knowledge of dBaseIII Plus. Their pre-test of basic economic understanding scores are listed in Table II below. Both classes were limited in size, both taught in 50-minute time blocks, and ceteris paribus.

Table II: Pre-Test of Basic Economic Concept Understanding - "Traditional Class"

Number Correct	Score	Percent in This Group
18 - 20	Excellent	7
16 - 17	Very Good	11
12 - 15	Good	32
11 or less	Needs Improvement	50

Conclusions

The microcomputer spreadsheet appears to facilitate learning and retention in the principles of economics classes over a variety of economic areas. This is true in both micro and macro economic analysis. It is equally valuable in explaining the Keynesian Cross and the Production and Cost Theory. Student evaluations of the use of the computer in their classroom were very complimentary and supportive as illustrated by the table below.

Early indications are that there was marked improvement in several areas of learning in the use of the computer and the spreadsheet approach to the study of economics. Attention in class, class attendance, participation and cooperativeness, promptness of homework assignments at due date, and grade averages, and retention all reflected a positive influence of the use of the computer and related software in the economics classroom. Although a complete analysis of all these attributes has not been accomplished to date, the following are relevant to the issues at hand.

Attendance in the electronic classroom averaged 94 percent for the semester while for the traditional class it was only 80 percent, with roll taken every day in each class. Overall grades for the semester in the electronic classroom averaged out at a B+ range with those in the traditional class averaging at B-, using basically the same test material, the same amount of time allotted for test taking, all grading done by the instructor of the class personally, and all grading done under a 10 point scale with a minimum of 60 as passing. Not one single person failed the computer-aided class, while three failed the traditional lecture class. Further analysis of the grade distribution, attendance patterns, and other attributes of the study are under investigation.

Post test results from texts given to students one semester after taking Principles I or II in the electronic classroom compared with those in traditional classes taught by the same instructor proved very interesting. Those in the electronic class showed a higher retention rate of basic economic concepts than those in traditional classes. Neither rate was complimentarily impressive. The average score in a comparably sized group in a traditional setting scored 25 percent retention of basic concepts and ideas. However, the electronic spreadsheet students scored considerably above that at 44 percent. Clearly there were other factors involved, and no formal analysis has been completed at this date, but it seems clear that the use of the microcomputer in the Principles of Economics I and II, bring a challenging dimension to the new world of instruction.

Overall, using the Computer Network in the Electronic Classroom student response has indicated the following:

Table III: Response Modes

1 agree strongly	**2 agree**	**3 neutral**	**4 disagree**	**5 disagree strongly**
I."Using the Computer Network helped me enjoy class more"				
42%	38%	10%	7%	3%
II."Answering questions in class on the computer helped my understanding"				
54%	34%	8%	3%	1%
III."I paid more attention in class with the Computer Network"				
20%	28%	26%	15%	11%
IV."Overall, I thought the use of the Electronic Classroom was good"				
44%	42%	8%	2%	4%

References

Adams, F. Gerard and Eugene Kroch. "The Computer in the Teaching of Macroeconomics," *The Journal of Economic Education*: 1989 (Summer) Vol. 20: 269-280.

Berquist, William H., and Steven R. Phillips. *A Handbook for Faculty Development*, Council for the Advancement of Small Colleges; Washington, D.C., 1975.

Booms, B. H., and D. L. Kaltreider, "Computer-aided Instruction for Large Elementary Classes," *American Economic Review Proceedings*: 1974 (May) 408-13.

Intentional Educations. *Using Wordstar 3.3, VP-Planner and dBase III Plus*, New York, McGraw-Hill, (Module III: VP-Planner) 1987, pp. VP-1 to VP-74.

Khandker, A. W. and William E. Wehrs. "Integrated Microcomputer Graphics and Simulation in Open-Economy Macroeconomics," *The Journal of Economic Education*: 1990 (Spring) Vol. 21, 167-180.

Lewis, D. R., B. R. Dalgaard, and C.M. Boyer. "Cost Effectiveness of Computer-assisted Economics Instruction," *American Economic Review*: 1985 (May) 91-96.

Paden, D. W. and M. D. Barr. "Computer-assisted Instruction in an Elementary College Economics Course," *Computers and Education*: Vol. 4, 259-67.

Siegfried, J. J. and R. Fels. "Research on Teaching College Economics: A Survey," *Journal of Economic Literature*: 1979 (September) Vol. 17, 923-69.

Smith, L. Murphy and L. C. Smith, Jr. "Teaching Microeconomics with Microcomputer Spreadsheets," *The Journal of Economic Education*: 1988 (Fall) Vol. 19, 363-389 and 1989 (Winter) Vol. 20, 73-92.

Microeconomic With Microcomputers:
Graphing The Ah-Ha

Quentin P. Ciolfi
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In April of 1987, I initiated work on an idea to modify my microeconomics curriculum to include microcomputers. I was using Economics by McConnell at the time. No text or available curriculum proposals included use of microcomputers in the instruction of the concepts and theories in the course. I felt the need to instruct my students in its application to some of the models in microeconomic theory.

At first, it required me to write a spreadsheet that covered only one of the theoretical models in microeconomics, the Pure Competition market model. From that software base and the concomitant Pure Comp file saved on the software, I developed other market models very quickly. I worked on the spreadsheet in typed form but needed something else.

By January of 1989, I had developed the spreadsheet in VP Planner, a computer software application for spreadsheets and graphs. It was a spreadsheet for the Pure Competition market model drown by McConnell. I also had drown the graphs for the model. I used VP Planner initially because it was too expensive to use LOTUS 1-2-3 at our campus. By then, I also had developed a homework assignment for my macroeconomics students to do on VP Planner.

Critiquers

Doubtless to say from the context, this change in my microeconomic curriculum impacts more than my students. Many stakeholders are affected by the change because my students and those attending the conference workshop associate with many other people. Using this spreadsheet and concomitant graphing package exposed the students to a novel instructional method in my microeconomics course. It led to other interactions as well.

For instance, the professors and administrators attending the workshop associate with many people worldwide. They also have classes on the topic. Many intend on changing their curriculum for their students and using the instructional tool in their course to enhance learning of the microeconomic models available on the disk provided in the workshop.

More are affected than just those attending the conference and their students. My students also go into the world with a new tool for examining cost and revenue data in a market setting. This adds to their work skills.

The employer of those students is impacted by this curriculum change as well. This method supposedly improves the quality of the students' workplace skills which makes them more efficient and more productive for the employer.

Worker efficiency and productivity contribute to the public good as well. Lower costs and reduced time expended to do the same amount of effort increase the gross domestic product this enriching out standard of living per capita in society. In general, myriad stakeholder hold an interest in this curriculum change or instructional approach to teaching microeconomic. Different groups in different social settings besides the classroom will be impacted by this change.

It is not the cardinal task of curriculum merely to provide answers. Learning should also provoke questions. Students should constantly strive to achieve a higher level of learning. They must master learning on a higher plane in order to understand the unique dimensions of themselves, their subject matter, the discipline and the related world. They should also try to relate the topic to other disciplines of study and areas or issues.

My microeconomic curriculum change has challenged them to learn and use the microcomputer and how to use a spreadsheet and graphics program on the microcomputer.Many of the students have not used the microcomputer with a spreadsheet example. Nor have they had to graph a microeconomic spreadsheet model; not even those who had the required economics in high school.

As well as the learning of keyboarding and computer skills--an adaptation from the office technology curriculum, students in my class receive exposure to hidden and null microeconomic goals. Microeconomic stresses theory based on the business goal of profit maximization. Using the computer, I can get the students to play "what if" games and analyze the results of changes given other microeconomic goals like sales maximization and suboptimization. Ethical issues, like the cost of pollution, can be discussed as well.

MICROECONOMICS WITH MICROCOMPUTERS

1. THE MICROCOMPUTER SPREADSHEET PACKAGE.
2. THE SPREADSHEET ANATOMY.
3. VITAL KEYSTROKING.
4. KEYBOARD COMMANDS.
5. MICROECONOMIC SPREADSHEET.
6. USING GRAPHS.
7. MICROECONOMIC GRAPHICS.
8. OTHER GRAPHS.
9. SENSITIVITY ANALYSIS.
10. OTHER OPTIONS.
11. SYSTEM CONFIGURATION.
12. THE PAST & THE FUTURE CLASSROOM/OFFICE?

THE MICROCOMPUTER SPREADSHEET PACKAGE

* STORAGE & RETRIEVAL OF DATA

* ARRANGEMENT OF DATA IN COLUMNS & ROWS

* MANIPULATION OF DATA (COPY/MOVE/SORT/MERGE)

* ARITHMETIC CALCULATIONS & MATH FUNCTIONS

* CONTIGUOUS DISPLAY W/ ALWAYS PRINTING

* SENSITIVITY ANALYSIS

* MACRO PROGRAMMING

* MORE

THE SPREADSHEET ANATOMY

* CELLULAR GRID

* CONTROL PANEL

* 1-2-3 MENU COMMANDS

* OPTION MENUS

* FILE/SCREEN CELLS

VITAL KEYSTROKING

* INVOKING 1-2-3

* ENTERING LABELS

* ARITHMETIC FORMULAS

* RELATIVE & ABSOLUTE REFERENCING

KEYBOARD COMMANDS

The following keys perform important purposes in LOTUS 1-2-3:

/ (SLASH)

ESC (ESCAPE)

<---' (ENTER)

HOME

END

DEL (DELETE)

<-- (BACKSPACE)

SHIFT

TAB

CTRL

ALT

PRTSC

SCROLL ARROWS & PAGE SCROLLS

TOGGLES

FUNCTION KEYS (F1-F12)

/FRVPPROJECT (ENTER) to retrieve the spreadsheet

COST/REVENUE ANALYSIS

Quantity of Output (units per day)	Quantity of Labor (labor hours per day)	Added Labor Hours per Added Unit of Output	Added Units of Output per Added Labor Hour (Marginal phys product of labor)	Total Variable Cost	Total Fixed Cost	Total Cost	Marginal Cost (dollars per unit)	Average Variable Cost (dollars per unit)	Average Fixed Cost (dollars per unit)	Average Total Cost (dollars per unit)	Sales Price	Sales Quantity	Total Revenue	Marginal Revenue	Total Profit	Average Revenue
0	0.00			$0.00	$2,000.00	$2,000.00					$700.00	0.00	$0.00		($2,000.00)	
1	38.00	38.00	0.026	$380.00	$2,000.00	$2,380.00	$380.00	$380.00	$2,000.00	$2,380.00	$700.00	1.00	$700.00	$700.00	($1,680.00)	$700.00
2	72.00	34.00	0.029	$720.00	$2,000.00	$2,720.00	$340.00	$360.00	$1,000.00	$1,360.00	$700.00	2.00	$1,400.00	$700.00	($1,320.00)	$700.00
3	102.50	30.50	0.033	$1,025.00	$2,000.00	$3,025.00	$305.00	$341.67	$666.67	$1,008.33	$700.00	3.00	$2,100.00	$700.00	($925.00)	$700.00
4	130.00	27.50	0.036	$1,300.00	$2,000.00	$3,300.00	$275.00	$325.00	$500.00	$825.00	$700.00	4.00	$2,800.00	$700.00	($500.00)	$700.00
5	155.00	25.00	0.040	$1,550.00	$2,000.00	$3,550.00	$250.00	$310.00	$400.00	$710.00	$700.00	5.00	$3,500.00	$700.00	($50.00)	$700.00
6	178.00	23.00	0.043	$1,780.00	$2,000.00	$3,780.00	$230.00	$296.67	$333.33	$630.00	$700.00	6.00	$4,200.00	$700.00	$420.00	$700.00
7	199.50	21.50	0.047	$1,995.00	$2,000.00	$3,995.00	$215.00	$285.00	$285.71	$570.71	$700.00	7.00	$4,900.00	$700.00	$905.00	$700.00
8	220.00	20.50	0.049	$2,200.00	$2,000.00	$4,200.00	$205.00	$275.00	$250.00	$525.00	$700.00	8.00	$5,600.00	$700.00	$1,400.00	$700.00
9	240.00	20.00	0.050	$2,400.00	$2,000.00	$4,400.00	$200.00	$266.67	$222.22	$488.89	$700.00	9.00	$6,300.00	$700.00	$1,900.00	$700.00
10	260.00	20.00	0.050	$2,600.00	$2,000.00	$4,600.00	$200.00	$260.00	$200.00	$460.00	$700.00	10.00	$7,000.00	$700.00	$2,400.00	$700.00
11	282.00	22.00	0.045	$2,820.00	$2,000.00	$4,820.00	$220.00	$256.36	$181.82	$438.18	$700.00	11.00	$7,700.00	$700.00	$2,880.00	$700.00
12	305.00	23.00	0.043	$3,050.00	$2,000.00	$5,050.00	$230.00	$254.17	$166.67	$420.83	$700.00	12.00	$8,400.00	$700.00	$3,350.00	$700.00
13	330.00	25.00	0.040	$3,300.00	$2,000.00	$5,300.00	$250.00	$253.85	$153.85	$407.69	$700.00	13.00	$9,100.00	$700.00	$3,800.00	$700.00
14	357.50	27.50	0.036	$3,575.00	$2,000.00	$5,575.00	$275.00	$255.36	$142.86	$398.21	$700.00	14.00	$9,800.00	$700.00	$4,225.00	$700.00
15	388.00	30.50	0.033	$3,880.00	$2,000.00	$5,880.00	$305.00	$258.67	$133.33	$392.00	$700.00	15.00	$10,500.00	$700.00	$4,620.00	$700.00
16	422.00	34.00	0.029	$4,220.00	$2,000.00	$6,220.00	$340.00	$263.75	$125.00	$388.75	$700.00	16.00	$11,200.00	$700.00	$4,980.00	$700.00
17	460.00	38.00	0.026	$4,600.00	$2,000.00	$6,600.00	$380.00	$270.59	$117.65	$388.24	$700.00	17.00	$11,900.00	$700.00	$5,300.00	$700.00
18	502.50	42.50	0.024	$5,025.00	$2,000.00	$7,025.00	$425.00	$279.17	$111.11	$390.28	$700.00	18.00	$12,600.00	$700.00	$5,575.00	$700.00
19	550.00	47.50	0.021	$5,500.00	$2,000.00	$7,500.00	$475.00	$289.47	$105.26	$394.74	$700.00	19.00	$13,300.00	$700.00	$5,800.00	$700.00
20	603.00	53.00	0.019	$6,030.00	$2,000.00	$8,030.00	$530.00	$301.50	$100.00	$401.50	$700.00	20.00	$14,000.00	$700.00	$5,970.00	$700.00
21	662.00	59.00	0.017	$6,620.00	$2,000.00	$8,620.00	$590.00	$315.24	$95.24	$410.48	$700.00	21.00	$14,700.00	$700.00	$6,080.00	$700.00
22	727.50	65.50	0.015	$7,275.00	$2,000.00	$9,275.00	$655.00	$330.68	$90.91	$421.59	$700.00	22.00	$15,400.00	$700.00	$6,125.00	$700.00
23	800.00	72.50	0.014	$8,000.00	$2,000.00	$10,000.00	$725.00	$347.83	$86.96	$434.78	$700.00	23.00	$16,100.00	$700.00	$6,100.00	$700.00
24	880.00	80.00	0.013	$8,800.00	$2,000.00	$10,800.00	$800.00	$366.67	$83.33	$450.00	$700.00	24.00	$16,800.00	$700.00	$6,000.00	$700.00

BEST COPY AVAILABLE

USING GRAPHS

* LINE (SCALING THE GRID) A line graph can map trends over time and cost changes as production increases. For instance, revenue and costs can be compared as output expands.

* BAR (SHADY COMPARISONS) A bar chart can show distinctions between one set of data and another.

* PIE (PORTIONS OF ONE TOTAL) A pie chart can illustrate the different costs at one level of output.

* STACKED BAR (PORTIONS OF SEVERAL) A stacked bar design displays several sets of data over time or as output rises. For instance, different costs can be shown as output rises.

* XY (ANALYSIS OF CHANGE/DIFFERENT SCALES) An X-Y diagram reveals the relationship between different data sets. For instance, a specific cost can be compared to revenue as output rises. Totals costs and revenues can be compared with averages to reveal trends as well. The totals would normally be plotted on the left side or vertical axis and the averages depicted on the right side.

CAUTION: Business charts and diagrams should follow the standards of simplicity, unity, emphasis and balance in order to make effective use of graphics. KISS your graphs!

MICROECONOMIC GRAPHS

Keystrokes summoning

Graph Menu	Range Limits
/ (ENTER)	A17.A35 (ENTER)
G (ENTER)	A (ENTER)
T (ENTER)	H17.H35 (ENTER)
L (ENTER)	B (ENTER)
X (ENTER)	I17.I35 (ENTER)
	C (ENTER)
	K17.K35 (ENTER)
	D (ENTER)
	Q17.Q35 (ENTER)

V(iew) to see graph on screen

(ENTER) PRTSC to print graph on screen

SENSITIVITY ANALYSIS

* WORKSHEET WHAT-IF

* WINDOWING

* GRAPHIC ANALYSIS

*SIDE-BY-SIDE GRAPHS

OTHER OPTIONS

* AESTHETICS (e.g., Clip Art)

* PRINTING

*WYSIWYG (What you see is what you get)

* MACROS

* CELL & SPREADSHEET PROTECTION

* DATA (FILL/DISTRIBUTION/TABLE)

* DATABASE

* WORD PROCESSING & OTHER APPLICATIONS

SYSTEM CONFIGURATION

* KEYBOARD

* PRINTER

* MONITOR

* DISK DRIVES

* OPERATING SYSTEM

* MICROPROCESSOR

* MATH COPROCESSOR

* RANDOM ACCESS MEMORY (RAM)

* GRAPHICS ADAPTOR CARD

THE PAST

This demostration presented the preceding topics:

1. THE MICROCOMPUTER SPREADSHEET PACKAGE.
2. THE SPREADSHEET ANATOMY.
3. VITAL KEYSTROKING.
4. KEYBOARD COMMANDS.
5. MICROECONOMIC SPREADSHEET.

6. USING GRAPHS.

7. MICROECONOMIC GRAPHICS.

8. SENSITIVITY ANALYSIS.

9. OTHER OPTIONS.

10. SYSTEM CONFIGURATION.

THE FUTURE CLASSROOM/OFFICE?

We live in the era of the technocrat. Businesses, government agencies, educational institutions and other organizations use computers and related technologies to handle tedious paperwork, provide quality service to customers, generate clearer answers and provoke more challenging thought for students, reduce waste in industry, produce sufficient inventory quantities just in time to meet demand anywhere in the world, and assist managers in making very long-range plans and much better decisions.

The ability to utilize computer graphics in many forms of educational communication, from oral presentations to written reports, is being recognized as a crucial skill. Increased attention has been focused lately on ways to effectively express copious amounts of data effectively through computer graphics (Bertelson & Klemin, 1988). Simulation modeling of several different graphs using macros from Lotus 1-2-3 is an educational application espoused by Godin & Rao (1988). The University Honors Program at the Univeristy of Michiagan uses LOTUS 1-2-3 spread sheet, database, and graphics capabilities in the Accounting Principles course (Keros & Kruse, 1991). I use spreadsheets in Managerial Accounting which I also teach at BCC-Titusville.

The microcomputer pervades every activity on campus and elsewhere. Lotus 1-2-3 and other similar spreadsheet packages with graphics capability (E.G., MICROSOFT EXCEL) have become a de facto standard in the classroom and industry. This ubiquitous technology is therefore essential to know and use (Patton, 1990).

Whether an instructor integrates graphics into a course or not depends upon their own personal learning beliefs, Personal practical theories play a significant role in making curricular decisions about classroom instruction (Cornett, 1990). However, the learning potential of graphics and other computer technology cannot be discounted (Bozeman & House, (1988).

This presentation attempted to illustrate how instructors can effectively use Lotus 1-2-3 graphics in microeconomic to create wonderful pictures to make a point of get students through the Ah-ha syndrome. The essence of an integrated software package like Lotus 1-2-3 lies in its ability to evaluate the effects of changes in variables almost as fast as you can enter the changes

(Ciolfi, 1990). It is hoped that many more courses will be undertaken that teach valuable graphic skills necessary for effective communication and learning.

CONCLUSION

As the professor of all of the courses in the business administration discipline at Brevard Community College on the Titusville campus, my paramount thought when teaching students focuses on students learning the facts, principles and theories of capitalism and how to use them. Another cardinal idea essential to a good study of business flows from the fact that any enterprise--profit maximizing, educational, not-for-profit, etc--must meet the needs of the consumer to stay alive. In light of these core ideas, so called ivory tower theorists like myself must build a curriculum or program of instruction to meet these needs.

The classroom, moreover, must exhibit positive activity in which students master concepts useful to their presumed career or subject matter of study. The learning mist link to some goals--stated or not. Learning functional job skills, enhancing natural abilities, or seeking a career change are the major reasons cited by most non-traditional student who come to the community college, The median age if BCC students averages 25-28 years old. Many cite a preference for learning job-related skills instead of theory.

Consequently, I must respond to their wishes in order to keep my program alive and flourishing. I must adapt my program or curriculum to the needs of the student while simultaneously meeting the curriculum standards imposed by textbook writers and articulation agreement with institutions of higher education. No introductory microeconomic textbook on the level of McConnell's Economics possesses pedagogy that provides students with a microeconomic approach on the microcomputer, yet.

Furthermore, the world of business exists in a fluid environment. It must respond to change constantly and, because of this irregular environment, inexorable pressure pushes me to change my curriculum content to for this continuously unique world my students face. With knowledge proliferating at an exponential rate, core content must also posses organization that goes beyond the learning of facts and rules. It must give a student, at the very minimum, a glimpse of the thought processes which have led to the formation of a particular area of knowledge. They could use it in their present effort to satisfy individual needs and as the foundation of new knowledge as well.

REFERENCES

Bozeman, W.C. & House, J.E. (1988). Microcomputers in education: The second generation. Technological Horizons in Education (T.H.E.) Journal, 15, no. 7.

Bertleson, C.L.& Klemin, V.W. (1988). Teaching graphics for communication. T.H.E. Journal, 15, no. 7.

Bolocan, D.(1991). LOTUS 1-2-3 Simlified. Blue Ridge Summit, PA: TAB Books, a McGraw-Hill division.

Cornett, J.W.(1990). Utilizing action research in graduate curriculum courses. Theory Into Practice, 29, no. 3.

Ciolfi,Q.P.(1990). Using computers to teach microeconomic: Principles of profit maximization. Florida Education Computing Quarterly, 3, no. 1.

Eisner, Elliot W.(1984). Can educational research inform educational practice? Phi Delta Kappan, 65, no. 7.

Godin, V. & Rao, A. (1988). Using Lotus 1-2-3 for 'non-stop' graphics simulations. T.H.E. Journal, 15, no. 7.

Keros,J.W. & Kruse, G.M.(1991). The accounting principles course in the university honors program. Accounting Instructors' Report, 10, no. 2.

McConnell,C.R.& Brue, S.L.(1993). Economics. New York: McGraw-Hill.

Napier, H.A. & Judd, P.J.(1988). Mastering LOTUS 1-2-3. Boston: Boyd & Fraser.

Patton, J.(1990). The key to the future: Microcomputer applications. Business Education World, 71, no. 1.

Applying TQM In The Classroom

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It is often easier to teach the total quality management (TQM) philosophy than to practice it. Undergraduate education can be improved by applying (TQM) in the classroom. Will using only parts of the TQM philosophy be effective? W. Edwards Deming would probably have said you are tampering with the system - not improving it.

This paper will provide an overview of one instructor's effort to "go all the way" in applying TQM to improving learning in a senior level economics course. The emphasis is on describing how TQM related methodologies were applied in the course. Only brief references are made to content. The course, Current Economic Problems, was taught in the fall of 1993 with an enrollment of thirty-one students.

Below is a brief form applying the TQM philosophy to the learning process.

TQM PRINCIPLES	LEARNING APPLICATION
Customer focus	Learner focus
Employee involvement/empowerment	Student participation and empowerment
Data based decision making	Use of student and learning data
Systems approach	Learning process emphasis
Continuous improvement	Continual assessment an integral part of improving the learning process

PREPARATION
(Learner Focus/Data)

An initial paradigm shift required is to change from the role of instructor to that of a manager/facilitator of the learning process. In other words adopt a student-centered rather than a teacher-centered approach. As an instructor who relied primarily on lectures for many years, I felt I had done a good job if I was well prepared and covered the material. Good for me - not so good for passive note-taking students. It was a classic teacher-centered approach. Also, the emphasis has traditionally been on grades - not learning - and grading procedures are often an inspection process.

The book **The 7 Habits of Highly Effective People** by Stephen R. Covey was covered during the first two weeks of the course. Why this material in an economics course? If students are going to change their learning paradigms and take charge of their own learning they need good reasons and guidance on how to do it. The Covey book provides this and much more. For example, Covey explains why omitting daily preparation and cramming for exams is not an effective approach to learning. Students actually enjoy the book.

On the first day of class each student identified themselves and made his or her best funny face for the video camera. We chose a winner (actually two) for the best funny face. This introduction helped set an informal atmosphere for the class and the video tape was used to learn names. At the beginning of the second day I called each class member by name without reference to any notes. Caring enough to learn the students' names is probably more important to them than actually knowing their names.

Many faculty members probably feel they should make the judgment call on content of a given course. Student input may be used to shape the instructional methodology. However, Current Economic Problems lends itself to student involvement in determining both content and methodology. In the first few class meetings, students helped develop a course mission and course objectives as presented below.

MISSION STATEMENT

TO UNDERSTAND AND APPLY ANALYTICAL & CREATIVE THINKING, PROBLEM SOLVING AND INTERPERSONAL SKILLS THAT WILL BE USEFUL IN OUR PERSONAL AND PROFESSIONAL LIFE.

OBJECTIVES

1. TO GAIN A BETTER UNDERSTANDING OF THE GLOBAL ECONOMIC AND SOCIAL ENVIRONMENT THAT WE LIVE AND WORK IN.

2. TO VIEW KNOWLEDGE AS A SYSTEM OF CAUSES, CONSEQUENCES AND RELATIONSHIPS AND APPLY THIS SYSTEMS THINKING TO ACTUAL SITUATIONS.

3. TO UNDERSTAND AND CONFRONT OUR OWN AND THE BIASES AND VALUES OF OTHERS AND TO STUDY THE SIGNIFICANCE OF RACIAL, ETHNIC AND CULTURAL DIFFERENCES.

4. TO WORK IN SMALL GROUPS TO LEARN FROM OTHERS AND TO IMPROVE THE INTERPERSONAL SKILLS OF LISTENING, NEGOTIATION AND COOPERATION.

Students considered a list of skills that employers want in employees as part of the process for developing a mission statement and course objectives. An often cited list is from Workplace Basics, The Skills Employers Want (American Society for Training and Development) and is as follows:

1. Learning to Learn.
2. Listening and Oral Communication.
3. Competence in Reading, Writing, and Computation.
4. Adaptability: Creative Thinking and Problem Solving.
5. Self-Esteem, Goal Setting/Motivation, and Personal/Career Development.
6. Group Effectiveness: Interpersonal Skills, Negotiation, and Teamwork.
7. Organizational Effectiveness and Leadership.

The process for developing course objectives included the use of a career/education survey developed by the Center for Social Research at Bemidji State University. Much of the conceptual context for the survey is based on ideas in a book used in the course - **Work in America** by Robert Reich. Survey results indicated students' perceptions of their educational experiences including frequency of exposure to various topics. Students were asked to rank these topics in order of importance. Those items receiving a high ranking and a low frequency of past exposure were selected as objectives for the course.

While decisions on course objectives were being made, data was gathered from the students about their backgrounds, values, learning styles and interpersonal skills. Examples of forms used for collecting selected data appear in the Appendix as Item A and Item B. In addition to collecting written data I met with each student individually in my office for twenty to thirty minutes during the first two weeks of class. All of this information was considered in trying to improve the learning process in the course. For example, learning styles and other background data were used to establish in-class work groups.

Initially the students chose a combination of some lecture, some small group discussion and some class wide discussion for a typical class period. They also requested that guest speakers be invited to meet with the class. The most important current economic problem selected by students for study was "jobs". They wanted to know if they would be able to get a job and what would it be like? Other current topics selected for study were competitiveness, crime/drugs and environmental issues. Items suggested by the instructor that students adopted for study were generational values, critical thinking exercises and a survey of conditions in Pacific Rim Asia and Europe. These items together with the material in the Covey and Reich books made up much of the course content.

Students were given some choices about the basis for grades. These included a choice of two, three or four exams, how to weight daily quiz points, and how to weight points for outside the class group projects. Decisions on these questions were made by the students after the instructor left the classroom. Grades in the course were based on daily quiz scores (1/3), two exam scores (1/3), projects/reports (1/6), and instructor and student assessment of effort and commitment (1/6). Students were required to keep a personal chart that included their rating of how well they prepared for class and their contribution in class. A condensed version of this chart appears in the Appendix as Item C.

DO IT!
(Learning Process/Groups)

The class met two days a week for an hour and twenty minutes per day. Prior to each class period an out of class assignment, including specific questions to be discussed in class, was given to the students. These assignments were frequently accompanied by handouts of current information. A typical class period started with about twenty minutes of lecture that included frequent use of transparencies and brief video segments. Next students were asked to get in work groups of five to seven and discuss the assigned questions. This was followed by a class-wide discussion and quiz. The quiz format varied. Some days it was individual effort, while on others it was either group discussion of quiz material followed by individual answers, or submission of one quiz response per group.

Class members were given a choice of doing a group project or two written reports. Twenty-nine of thirty-one chose to do a group project. At first students asked to be assigned to a group of six but after some out of class discussions decided to form their own groups of five to seven. Criteria for selecting projects were as follows:

A. The project must be meaningful to team members.
B. The project must have direct impact on students.
C. The project statement describes a problem to be studied or an improvement opportunity, not a solution to be tried.
D. The project is defined as a relatively simple process with easily identified starting and ending points.
E. The project selected should not be a process that is currently being changed.
F. The project must be one that permits action to be taken during the fall term with adequate time to evaluate impact of action taken.

Students had to follow the Deming cycle of Plan, Do, Study and Act. Three interim oral reports and a final oral and written report of group projects were required. Projects completed by students included the following:

Improve bookstore services to ATU students.
Improve outdoor lighting around Corley Building.
Increase student participation in ATU Red Cross Blood Drive.
Improve high school students' perceptions of ATU.
Promote student participation in a recycling project.

Five guest speakers visited the class during the semester. The guest typically made a thirty minute presentation. This was followed by small group discussions of the message. The visit ended with a guest/class discussion of the issues. This format for guest/speaker visits was especially effective. Guests included the University president (an economist), a local plant manager of a Japanese owned company, an economic journalist, an information systems professor and a chemical engineer from Germany.

Exams in the course consisted of a mid-term and a final. Students were given twenty minutes at the beginning of an exam period to discuss a mini case. These discussions were held in small groups. After the discussions students had to independently write answers to the case which represented 40 percent of the exam. The remainder of the exam was taken individually. One third of the exam was based on daily quiz material.

Another feature of the exam was some student self-evaluation. A list of rating criteria, along with the mini case, was given to students. These evaluation standards are based on an adapted form of Benjamin Bloom's taxonomy of cognitive learning objectives (see Appendix -

Item D). Students were required to use these criteria to rate their answers on the mini case. The instructor rated students' answers to the mini case using the same criteria.

DID IT WORK?

(Assessment/Improvement)

Student feedback about how to improve the learning process was an ongoing activity during the course. A number of improvement suggestions emerged from class discussions. Early in the semester students were required to send improvement ideas via E-Mail to the instructor. Later an arrangement was made for sending anonymous E-Mail messages to a suggestion box address. Written recommendations for improving learning were also solicited in class about every two to three weeks. Many of the suggestions were implemented as the course was in progress.

Course objectives were interrelated which made it impractical to assess them independently. One straight forward approach to assessment is to simply ask the students what they learned. At the end of the semester students were asked to respond in writing to this question - "Briefly, what important things do you perceive that you learned in this course?" Following is a representative list of responses:

> "Not only discussing current economic problems but also life lessons."
>
> "How to communicate - work with others even if we do not have the same interests."
>
> "I feel like I'm learning how to get along with other people in groups, how to make myself try harder and be a better person, and more about life after school."
>
> "How to work as a group and formulate ideas that are much better then the one's that I would formulate on my own."
>
> "I am beginning to better understand how America got it start (economy-wise) and where America is going in the future."
>
> "I am learning discipline in studying and coming to class. I am refining my group skills and I am thinking more than in any other class."
>
> "I am excited about the materials we read. They are so current and so unlike textbooks."
>
> "Some of the major changes that are taking place in the job market and how that will affect my ability to get a job."
>
> "Learning about the world of economics as it relates to history-past and present- and all of us."
>
> "The class is doing more to prepare us for the "real world" than most others."

"Economics has always been hard for me to learn, but being able to discuss the chapters with my group has helped a lot."

"How to take personal initiative, and wanting to learn instead of being forced to learn. I feel that it is my responsibility to my group and to myself to always be prepared."

"Learning the ability to think more, not just look at what happens but why things happen."

Each of the above comments include one or more references to course objectives. While this approach does not necessarily indicate what students actually learned, it does provide their perceptions of what was important about the learning experience. The most frequently mentioned items are listed below by category. The number of times mentioned is in parenthesis.

1. Understand more about global economy (21)
2. Problem-solving/systems-thinking (19)
3. Group work (18)
4. 7 Habits material (16)

At the start and end of the semester students were asked to respond to the following question from a career/education survey developed at Bemidji State University. Responses appear at the left of each choice.

Assume, upon graduation from college, you are offered three jobs, each being equal in pay and other benefits. You must *choose the job* for which you have received the best education and training. Based on the education and training you have received so far, which job would you choose? (Please circle number of one answer.)

Start	End	
7%	0%	1. A JOB THAT REQUIRES YOU TO PRODUCE THE SAME KIND OF PRODUCT, OR PERFORM THE SAME KIND OF ACTIVITIES MANY TIMES OVER TO THE BEST OF YOUR ABILITY. In this job, your work is rewarded by the *quantity* of effort, production or services you render.
32%	19%	2. A JOB THAT REQUIRES YOU TO USE YOUR SKILLS TO PROVIDE A SERVICE DIRECTLY TO PEOPLE WHEN THEY DETERMINE THEY NEED IT. In this job, your work is rewarded by your ability to provide acceptable *specialized services* to the consumer.
61%	81%	3. A JOB THAT REQUIRES YOU TO WORK WITH OTHERS TO IDENTIFY PROBLEMS, SOLUTIONS AND MARKETS FOR YOUR IDEAS OR PRODUCT. In this job, your work is rewarded by your ability to adjust to highly unique situations, and do tasks and *create products or ideas* of high value although few in number.

Again, these are student perceptions but the results are consistent with progress on achieving course objectives. At the end of the semester there was a 33 percent increase in students choosing job number three which calls for creative thinking and problem-solving skills.

A Seven Habits Profile survey is available upon request for anyone purchasing the Covey book. Each student completed this survey at the beginning and end of the semester. There were three questions per each of the nine categories of the survey. The maximum number of points per category was eighteen. Differences for the beginning and ending scores were computed per student per category. The means of these differences per category were calculated and a one tail t test for significance was run. All mean values had a positive sign. Summary results are presented below:

INTERPERSONAL SKILLS SURVEY

FALL 1993

Category	Level of Significance	
	.05	.01
1. Emotional Bank Account	Yes	No
2. Life Balance	Yes	Yes
3. Proactivity	Yes	Yes
4. Begin With End in Mind	Yes	Yes
5. Put First Things First	Yes	Yes
6. Think Win-Win	Yes	No
7. Seek First to Understand	Yes	Yes
8. Synergy	Yes	No
9. Sharpen Saw	Yes	No

Results for all nine categories were significant at the .05 level and results for five categories were significant at the .01 level. While the differences in scores is not likely to be a result of chance, it is not clear how much of the improvement is associated with course activity.

One category - Proactivity - deserves special mention. The t test value for the mean of the differences for this category was 6.1712 - significant well beyond the .0005 level (3.646). A center piece of the TQM philosophy as applied to the classroom is for the learner to take responsibility for his or her learning.

COMMENTS

We - the students and I - decided what to cover in class and how to cover it. We had a good time learning about current economic problems. Compared with previous class experiences, the in-class "mood" of students was more relaxed and more attentive. Students came to class expecting to participate.

Applying the TQM philosophy in the classroom is an experimental process. There are no magic bullets. A willingness to study the learning process is a good place to start. How do students learn? Why do students learn? How can an instructor connect with the hot spots that trigger off intrinsic motivation in individuals? These and other difficult questions confront anyone who is committed to improving the learning process.

Giving up some control - especially of class time - can be a barrier that prevents faculty from trying to apply TQM in the classroom. Managers in business have the same problem. Students also resist change. Many are comfortable with the routine of skimming material between exams and cramming for tests. Preparing for and contributing to each class requires more self-discipline. Students complained that I did not lecture enough. This could be read - not enough spoon feeding. Understanding the change process is an important element in applying TQM in the classroom.

Finally, it is important to acknowledge that helping students learn is the principal task of instructors. It is not covering all the material in a text or controlling students via the leverage of grading or entertaining the class or - fill in the blank. The labels and jargon of TQM are unimportant. However, the philosophy of TQM can be a powerful guide for improving the learning process.

References

Bemidji State University, "Are You Receiving the Quality Education You Really Need?" - A Student Perspective, Center for Social Research, Bemidji, MN.

Bloom, Benjamin S., Editor, **Taxonomy of Educational Objectives** - Handbook 1: Cognitive Domain, Longman, New York, 1984.

Christensen, C. Roland et al Editors, **Education for Judgement** - The Artistry of Discussion Leadership, Harvard Business School Press, Boston, 1991.

Cotroneo, Keith, **Stylemaster** software, Personal Style Publishing, Hagerstown, MD, 1988.

Covey, Stephen R., **The 7 Habits of Highly Effective People**, Simon & Schuster, New York, 1989.

Covey, Stephen R., **Personal Leadership Application Handbook**, Covey Leadership Center, Provo, UT.

Davis, James R., **Better Teaching, More Learning** - Strategies for Success in Postsecondary Settings, The Oryx Press, Phoenix, AZ, 1993.

Deming, W. Edwards, **Out of the Crisis**. Massachusetts Institute of Technology Center for Advanced Engineering Study, Cambridge, MA, 1982.

Langford, David P., **Total Quality Learning Workbook**, Langford Quality Education, Billings, MT, 1992

Neter, John et al, **Applied Statistics**, Allyn and Bacon, Inc., Boston, 1978.

Parker, Glenn M. **Team Players and Teamwork**, Jossey-Bass Publishers, San Francisco, 1990.

QIP, Inc./PQ Systems, **Total Quality Transformation Improvement Guide**, Productivity - Quality Systems, Miamisburg, OH, 1991.

Reich, Robert B., **The Work of Nations** - Preparing Ourselves for 21st Century Capitalism, Random House, Inc., New York, 1991.

Scholtes, Peter R., **The Team Handbook**, Joiner Associates, Inc., Madison, WI, 1988.

Strauss, William and Howe, Neil, **Generations** - The History of America's Future 1589 - 2069, William Morrow and Company, Inc., New York, 1991.

APPENDIX - Item A

First Day Survey - Econ 4033
Fall 1993

1. Place an X by each of the following micro computer applications that you feel comfortable using.

____ Word Processing - Which program do you usually use? ____________
____ Spreadsheet - Which program do you usually use? ____________
____ Data Base Management - Which program do you usually use? ____________
____ Desk Top Publishing - Which program do you usually use? ____________
____ Others - List ____________

____

2. Have you used a mainframe computer at ATU or elsewhere? ____Yes ____No

If yes, what applications did you use? ____________

3. Are you employed? ____Yes ____No

If yes, approximately how many hours a week? ____________

4. Can you speak a language other than English? ____Yes ____No

If yes, which one(s)? ____________

5. Have you travelled outside the United States? ____Yes ____No

If yes, which countries have you visited? ____________

____

6. Have you ever lived outside the United States? ____Yes ____No

If yes, in which countries? ____________

7. Would you be willing to work outside the United States if career opportunities were favorable? ____Yes ____No

8. What classroom experience have you enjoyed the most in college?

____

____

9. What do you feel could improve the learning process in a typical college course?

____

APPENDIX - Item B

ECON 4033

Value Survey - Economics 4033

How important are these objectives to you? Please use the following scale to rate each objective.

1 - Unimportant
2 - Important
3 - Very important
4 - Essential

1. Becoming accomplished in a performing art ______
2. Obtaining recognition from colleagues ______
3. Influencing the political structure ______
4. Influencing social values ______
5. Raising a family ______
6. Being very well-off financially ______
7. Helping others who are in difficulty ______
8. Making a contribution to scientific theory ______
9. Keeping up to date with political affairs ______
10. Being successful in own business ______
11. Developing a meaningful philosophy of life ______
12. Promoting racial understanding ______
13. Getting married ______

Indicate: ________Male _______Female

APPENDIX - Item C

ECON 4033 - FALL 1993

	August			September									October	
Date:	26	31		2	7	9	14	16	21	23	28	30		5
Attendance:														
Class Preparation:														
Class Contribution:														
Quiz Scores:														
Day	1	2		3	4	4	6	7	8	9	10	11		12

Attendance:
P - Present
0 - Absent

Class Preparation & Contribution
4 - "A" Level - Excellent
3 - "B" Level - Above Average
2 - "C" Level - Average
1 - "D" Level - Poor
0 - Absent

Quiz Scores:
1 - 10
0 - Absent

RATING AND QUIZ CHART
ECON 4033

RATINGS & QUIZZES

APPENDIX - Item D

RATE YOUR ANSWER ON EACH CRITERIA LISTED BELOW. USE A SCALE OF 1 TO 10 WITH 10 BEING EXCELLENT.

1. AWARENESS - Remember __________
   (Did you recall and identify important information?)

2. COMPREHENSION - Understanding __________
   (Did you explain important information?)

3. APPLICATION - Solve Problem __________
   (Did you apply your knowledge to the situation?)

4. ANALYSIS - Logical Order __________
   (Did you separate ideas into component parts for logical analysis - i.e. assumptions, facts, opinions & logical conclusions?)

5. SYNTHESIS - Create __________
   (Did you put together ideas to create your own hypothesis or model?)

6. EVALUATION - Appreciate __________
   (Did you make a judgement, using appropriate criteria, about the value of ideas, procedures and methods?)

A Beverage Industry Case Study Approach To Introductory Economics

Michael L. Connell
Monmouth College

Introduction

Students in introductory economics courses frequently complain that economic theory is abstract and unrelated to their daily lives. These early misconceptions are not easily changed ,and such misconceptions make teaching economic principles difficult and reduce the likelihood that students will take additional economics courses in the future. Our department has attacked this problem by creating a non-technical introduction to economics. Students are exposed to the tools of economic analysis by using economic theory to explain real world phenomena that affects their daily lives.

Economic history provides a rich factual setting in which the power and usefulness of economic theory can be unambiguously demonstrated. Railroads, autos and steel are familiar examples of industries in which economic analysis has been widely used to explain industrial development. Unfortunately, most students have only marginal contact with or interest in these industries. I have found the beverage industry to be an equally rich source of economic applications with the added advantage that college students are personally interested in beer and soft drinks. This personal linkage between students and the beverage industry presents a unique educational opportunity. Demonstrating the relationship between industrial change and economic theory has proven to be a powerful teaching technique.

Our department's introductory course examines the development of the U.S. beverage industry since 1860. The subject matter is a combination of U.S. economic history, technology studies, industrial organization analysis, marketing and microeconomic theory. Among other things, course material includes an overview of U.S. economic history, the corporate histories of the Coca-Cola Company, the Pepsi-Cola Company, Anheuser-Busch, Incorporated and the Miller Brewing Company.

Traditional courses introduce an economic theory and then use a self contained factual setting to illustrate the particular theory in question. This approach presupposes that the students are "interested in learning economic theory" but are having difficulty grasping the concepts. For many students this initial optimistic assumption is unwarranted and as a result very little learning occurs. Our course approaches introductory theory from a non-traditional perspective. We start with subject matter that is of interest to a larger percentage of students and then use economic theory to explain the observed facts. Graphs, theory and analytical tools are introduced as it arise in the industry study. This approach is both simple and powerful. Students learn not to study theory for the sake of theory, but to explain society.

In this paper, I will illustrate the teaching potential of this approach with two examples from the brewing industry. Anheuser-Busch and Miller Brewing are became industry leaders because they recognized the opportunities presented by economic change. Almost exactly 100 years apart Anheuser-Busch and Miller utilized technological changes developed by others to become the first competitor in a new market. As a result, these firms grew while other left the industry during a period increasing market concentration. In the 1870's, Busch was the first competitor to expand geographic markets and capture economies of scale in production. In the 1970's, Miller was the first firm to successfully market a new product--Lite Beer. These successful changes were based on an understanding of economics. A study of these changes demonstrates the usefulness of economic analysis as a tool for understanding the real world.

The Anheuser-Busch Story

When 90% of the Americans think of beer, they think of lager beer. Lager beer is lighter, clearer and more highly carbonated than non-lager beer. Although beer has been brewed for over 6000 years, lager beer has been around for less than 600 years. The different styles of beer result from different production processes. Traditional English style beers (heavier, darker and less carbonated beers) are produced using a shorter, warm fermentation process in which the brewing yeast live on the top of the fermenting beer. Lager brewing which began in Germany sometime around 1400 A.D. uses a bottom fermenting yeast and requires a longer, colder fermenting process. Lager beer must be stored at cold temperatures for up three months to age properly. In fact, the word "lager" comes from the German word "lagern" meaning to store.

Within 100 years of its introduction, lager became the preferred beer of Germany and during the fourteenth and fifteenth century lager was the only type of beer brewed in Germany. Although lager beer was extremely popular in Europe, it was not brewed in America until 1840. Since very little was known about yeast and biology, American brewers had no way of isolating a bottom-fermenting yeast and efforts to transport bottom-fermenting yeast across the Atlantic were unsuccessful. When faster clipper ships were introduced, the bottom-fermenting yeast was able to survive the trans-Atlantic voyage.

In 1840 John Wagner, a brewmaster from Bavaria, opened the first American lager brewery in Philadelphia. At first, the market for lager beer was restricted to German immigrants in Philadelphia. But the market soon expanded beyond the German immigrants and beyond Philadelphia and other lager breweries were opened. The German immigration which began in the 1840's resulted in large German neighborhoods in Philadelphia, New York, Cincinnati, St. Louis, Chicago and Milwaukee. These immigrants continued many of the customs of their homeland including lager beer.

The production conditions of lager beer and the existing transportation system determined the market structure of the early brewing industry. The lager beer was brewed in the winter and then stored in underground caverns for year-round use. The caves were kept cool with large winter ice harvests. The necessity for cool brewing and storage limited the lager beer industry to areas of the United States where winters are cold enough winters to produce a consistent annual ice harvest. It is not a coincidence that the great American brewing cities were Milwaukee, Rochester, Minneapolis, Chicago, Cincinnati, Pittsburgh and St. Louis. These cities bring together the key ingredients essential to lager brewing: cold winters, plentiful water supplies, caves and German immigrants. The geographic distribution of the industry is exactly as would be predicted by economic location theory.

The number and size of firms in the industry are also consistent with theoretical predictions. Product characteristics limited the distribution of beer to small, local markets. Beer is mostly water and thus, heavy and hard to transport. Beer wagons pulled by horses could not deliver large, heavy kegs very from the brewery. (Some beer was shipped on riverboats but this was a very small portion of total output.) In addition to the transportation problems created by bulkiness, lager beer is more susceptible to spoilage than English style beer. A short product life reinforced the transportation problem and as a result almost all beer sold very close to the point of production.

The transportation problems and production conditions dictated small, northern breweries. But the world is a dynamic place; old problems are constantly being solved as new solutions are found. The transportation and product life constraints that limited lager distribution were soon to change, thus opening new vistas of economic opportunity.

In 1857, Louis Pasteur, an obscure French research chemist, began an examination of brewing and distilling problems caused by spoilage. Pasteur discovered that microscopic bacteria present during fermentation spoiled beer and wine. He heated wines to high temperatures for short periods of time to kill the unwanted bacteria and reduce the spoilage problem. Pasteur showed that a yeast free of bacteria produced a fermentation free of disease. During the 1870 war between Germany and France, Pasteur patriotically extended his wine preservation techniques to beer in order to aid French brewers at the expense of German brewers. Although Pasteur was steaming beer by 1870, he did not published his findings until 1876.

While Pasteur was extending the product life of beer, the growth of the American railroad system was making the access to larger markets possible. Adolphus Busch was the first entrepreneur to recognize the opportunities that these changes presented for the brewing industry.

In 1860, Eberhard Anheuser, a successful German soapmaker in St. Louis, acquired the controlling interest in a small brewery when the brewery owner defaulted on a loan. When Anheuser subsequently took complete control of The Bavarian Brewery, it was the 29th largest of the 40 St. Louis breweries. Over time, Anheuser's son-in-law, Adolphus Busch bought into and eventually gained control of the brewery. Busch was also a recent German immigrant with strong ties to his homeland. Although Anheuser's beer was not very good, Adolphus, the master salesman, was able to convince many bar owners to sell Bavarian Brewery beer and sales increased.

Sales grew from 4000 barrels in 1865 to 18,000 barrels in 1870 (Anheuser-Busch was the seventh largest brewer in St. Louis). Sales continued to grow and by 1877 Anheuser-Busch was the second largest brewer in St. Louis and the 32nd largest in the nation. Within 12 years (1889), Anheuser-Busch was the second largest brewer in America. This explosive growth as the result of the application of new technology that started in Europe. While visiting his homeland, Busch learned about Pasteur's work and he brought the pasteurization process home to St. Louis. In the early 1870's, Busch became the first American brewer to pasteurize beer. Because large kegs could not be easily pasteurized, smaller containers were introduced. As a result of the necessity to pasteurize in small containers, Busch was the first American brewer to bottle beer on a large scale. The beer was pasteurized by dipping wire baskets filled with pint and quart bottles into tubs of boiling water.

Pasteurized bottled beer did not spoil as quickly as kegs and unpasteurized beer. With longer shelf life and packaged in smaller containers Busch's beer could be shipped greater distances. Busch realized the market potential of bottle beer in the virtually competition-free southern states. The developing railroads provided access for the new product to untapped markets. By 1872, Busch was selling bottled beer in Texas. And by 1876, Busch was selling bottled beer in remote Colorado mining towns. Busch's market penetration of the South and West was swift and complete.

Busch realized refrigerated railroad cars would further expand his markets. In 1876, Busch saw refrigerated railroad cars displayed at the Centennial Celebration in Philadelphia and by the end of the year, he had purchased five. By the end of the next year, he had forty cars in operation. In February of 1878, Busch and others formed the St. Louis Refrigerator Car Company. By 1888, Anheuser-Busch had a fleet of 850 refrigerator cars delivering beer to every part of the nation. The cars were really just large, well insulated ice chests (mobile mechanical refrigeration was not possible). The railroad cars were loaded with ice and beer in St. Louis for shipment to distant markets. As the ice melted, the cars were restocked with ice from an extensive network of Anheuser-Busch railside icehouses. In 1884, Anheuser-Busch had 13 icehouse distribution sites in Texas alone.

With the increased sales and markets came expansion of the brewery in St. Louis. Larger, more efficient production was now possible (economies of scale were realized). The company enjoyed a most fortunate set of circumstances -- new products in new markets without competition that lowered per unit production costs! It is little wonder that the firm grew rapidly, became the industry leader and eventually became the largest brewery in the world. Although Anheuser-Busch was the leader and most successful firm to enter into these new markets but it was certainly not the only firm that bottled beer and increased production capacity. From 1880 to 1910 there was a steady decrease in the number of breweries at the time when total production was growing. Fewer, larger firms were competing vigorously for market share. Technological change and transportation improvements altered industry organization and the nature of competition.

When distribution was limited, there was no need for manufacturer identification and product differentiation. But as geographic markets expanded, the need for unique brand names arose and beers began to acquire trademarked names. In 1872, Anheuser-Busch began using the A and the eagle symbol. In 1879 Ballentine Beer of Newark, New Jersey, trademarked the three interlocking rings as a symbol. Thereafter, Schlitz began using a globe surrounded by a Schlitz label and Miller Brewing adopted the girl sitting on the crescent moon. In the 1890's, Pabst began using its familiar blue ribbon trademark.

The market success and growth of Anheuser-Busch is the direct result of economic factors. Changes in production technology resulted new differentiated products. The new products utilized a different distribution system which enabled the firm to expand its geographic market. An expanded geographic market permitted increased production capacity and the realization of economies of scale. These scale economies lowered production costs and increased profit margins which in turn provided a source of capital for further expansion. With national expansion came the need for trademark names.

The Anheuser-Busch example illustrates that markets grow and change for reasons. Understanding what happened and why it happened is a powerful learning experience. This case study demonstrates to students that economic analysis is a valuable tool that can be used to explain the past and to predict future change in a way that the study of theory-for-the-sake-of-theory cannot. A similar example is the more recent success of Lite Beer from Miller.

The Lite Beer From Miller Story

In 1855 Frederick Miller left Germany at the age of 28 to move to Milwaukee where he purchased the idle Plank Road Brewery. Although first year production was very modest, by his death 33 years later, annual output had grown to 80,000 barrels. At the time, Miller Brewing was a large firm but not a industry leader. Under the leadership of Miller's son, Frederick Miller II, output rose to 500,000 barrels per year by prohibition. Miller Brewing weathered prohibition by making soft drinks and malt syrup and then completely modernized the brewery after repeal.

In 1947, a third Fred Miller took over the family brewery. He modernized the brewery and expanded capacity to 4,000,000 barrels per year. It appeared that a fourth Fred Miller would eventually assume control of the family brewery but a tragic accident changed those plans. Both Fred and Fred, Jr. were killed in small plane crash in 1952. The corporate attorney managed the brewery and the granddaughter of the original Frederick Miller acquired majority ownership (53% of the stock). In 1966, the granddaughter decided to sell the brewery because of her newly found religion. The W.R. Grace purchased her 53% ownership for $36 million.

In 1969, Phillip Morris paid $130 million for the Miller stock owned by W.R. Grace and the next year, Phillip Morris acquired the remaining stock for $97 million. At the time, Miller was the seventh largest American brewer with a 4% market share.

Phillip Morris had aggressively grown from the smallest of "big six" U.S. tobacco firms with a 9.4% market share in 1961 to the second largest with 25.2% market share in 1976. Phillip Morris had capitalized on their "ability to market and merchandise, using consistent and integrated themes aimed at the growth segments of the market." The tobacco industry was and is a highly competitive market in which aggressive competitors battle vigorously for market share.

The Phillip Morris managers realized that the highly traditional brewing industry had never experienced aggressive competition similar to that of the tobacco industry. Phillip Morris managers made major changes that disturbed the existing structure of the brewing industry and moved Miller from its small "also ran" status to the second largest firm in the industry.

Phillip Morris repositioned Miller from the low selling "champaign of bottled beers" to a more successful, youthful "It's Miller Time" image. They introduced Lowenbrau to compete with the highly profitable Michelob and they introduced 7 oz bottles for more complete market segmentation. For all products in all markets, they began heavy aggressive advertising. All these changes increased profits and growth, but the most successful change was the introduction of "Lite Beer from Miller."

In the brewing process, yeasts consume the simple sugars of malt barley producing alcohol and carbon dioxide. Traditional brewing yeast cannot break down some of the more complex carbohydrates present in the malt. In the 1960's a technological change occurred; new yeasts that could break down the complex carbohydrates were introduced. The result was a lower calorie, lower alcohol beer. In the late 1960's, Heilman Brewing introduced a low calorie beer, Gablinger, and The Peter Hand Brewery of Chicago marketed Mister Brau Lite. Both Heilman and Miester Brau marketed their low calorie beers at over-weight, diet conscious, white-collar suburbanites. "Diet beer" was neither appealing nor successful. When The Peter Hand Brewery fell into bankruptcy, it was purchased by Miller who needed additional production capacity because of its recent Phillip-Morris-led growth.

The new Phillip Morris marketing managers noticed a strange fact about Mister Brau Lite's sales. Sales were almost zero in most places, low in the white-collar suburbs which was the intended market niche and high in Anderson, IN. Anderson, IN is a very blue-collar industrial town, real beer drinker land, and yet Mister Brau Lite was the second best selling beer in town. Market researchers went to Anderson to find out why. The real beer drinkers in Anderson said "We like to drink a lot of beer, but the trouble with drinking a lot of beer is that you get filled up and have to stop drinking. You can drink a lot of this beer and not get filled up. This beer `taste great and is less filling.'" Those words were music to a marketing manager's ears -- a beer to drink so you can drink a lot of it. A product with its own unique market niche and a built in advertising campaign -- "Taste Great! Less Filling!"

Miller realized that they would have to give Lite a tough guy image to keep it from getting an unwanted "sissy" reputation. So they used tough ex-jocks in their massive introductory advertising campaign. When "Lite Beer from Miller" was introduced in 1975, the other national breweries did not react. As a result Miller gained a tremendous first mover advantage in the new market. Initially, Miller was spending so much on advertising that Lite Beer was barely breaking even. But the strategy worked and the product became extremely popular. Lite became the most successful new beer ever introduced. Within a year, Lite Beer sales had grown to 5 million barrels which exceeded Miller's entire production only four years earlier.

With the success of Lite Beer, other companies introduced light beers. Miller sued to claim trademark status for the words "Lite" and "Light Beer" but the U.S. Supreme Court ruled that Miller had failed to adequately protect its name and therefore the words "Lite" and "Light Beer" had become public domain. Despite the legal setback, Miller was a winner. Their successful product differentiation had increased market share and made them the second largest firm in the industry.

Phillip Morris brought their knowledge of product differentiation and market segmentation into a traditional industry and changed all of the rules. Many of the old firms had trouble adjusting and were left behind as a result the industry has become increasingly concentrated.

Conclusion

The market success of Anheuser-Busch and Miller provide opportunities to demonstrate the power and usefulness of economic analysis. In both cases technological change lead to change in the industry structure. These examples clearly demonstrate what is so hard to get across the students in conventional economics courses--change takes time and markets are dynamic institutions. Using economic analysis to explain these changes introduces students to economic theory in an interesting and non-threatening way. Allowing students to see the power and usefulness of theory at the beginning of their economic study increases the probability that they will understand the theory and increases the probability that they will take additional economics courses. I believe in this approach and I encourage others to critically examine the success of their introductory economics course to determine if a case study approach would benefit their students. The rigorous theory is still essential but it can wait until students more fully appreciate its importance.

Improving Economics Instruction In The First Course: Teach Economics As A Second Language

Richard Crowe
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A problem in teaching economics is that instructors concentrate so much on the parts (tools) that students lose sight of the mission of the course. An analogy: if we were teaching students how to raise a garden and the student mastered the use of common garden tools--eg. , spade, hoe, fertilizer--but failed to produce a crop, we would feel that we had failed in our task. In the economics classroom we teach students how to construct various models and how to calculate several statistical conditions. The students also learn many principles and laws, each of which is an important tool--but only a tool. John Maynard Keynes once explained that "economics is a method rather than a doctrine, an apparatus of the mind, a technique of thinking, which helps its possessor to draw conclusions."[1] The "crop" that economic teachers must produce is to enable students to use the tools of economics to make decisions, e.g., to process data and arrive at independent conclusions. Their ability to use economic tools will improve their individual decision making which will lead to improved use of our resources in the aggregate.

What Is EcSL?

According to Rendigs Fels of Vanderbilt University, the best model for teaching economics is that of teaching a foreign language rather than that for teaching history or English.[2] Literature on the teaching of foreign languages differentiates between instruction in foreign language and English as a second language (ESL). In both cases a strong audio-lingual approach is used in which students hear many repetitions of the new language and are encouraged to use their new terminology often. Many games and physical activities are used in the classroom to individualize student participation. The goal is to teach each student the terms, their meanings, and basic applications within the culture under study. When immersion is used as a teaching technique the class is only permitted to communicate via the language under study. Field trips to restaurants, retail centers, and/or the native country where use of the language can be tested are critical teaching strategies.

In the ESL model, the instructor teaches English to foreign-speaking students (usually in preparation for future study in which English will be the only language). ESL is a preferred teaching situation because students are immersed in English-speaking situations in most activities and almost all media. ESL students receive constant repetition and rapid feedback in and out of the classroom that reinforces successful usage of the English language. The students are able to apply the language successfully, which motivates them to move more rapidly from simple to complex usage. Because we live in an environment that demands economic decision making from our citizens, encourages movement from simple to more complex economic decisions throughout life, and presents economic data via media, the teaching approach described herein has been referred to as EcSL (economics as a second language). our goal is to use EcSL in the first economics course to teach students a great deal of specific economic information and how to study economics, resulting in students possessing the critical skills necessary to make economic decisions.

The Hazard Community College Approach

Hazard Community College economics students represent a cross-section of students. Their ages, experiences, abilities, goals, and interests in taking a principles of economics class differ. We have attempted over the past several years to create a situation in which students with various levels of skills and abilities have followed a systematic approach to learning. The results have been (1) more students know more about economics after taking the class; (2) they are better able to apply economic concepts in their daily lives; (3) they are more confident about using economic terms and tools; (4) they have learned to work in a more cooperative, less competitive environment; (5) they see a stronger relationship between economics and life; (6) they are better prepared to perform their role as citizens; (7) they use self-questioning study techniques; (8) they use rehearsal study techniques; (9) they use teacher-provided schemas for learning economics; and (10) they prepare their own schema and present it for credit in the course.

But Students Must Know the Terms . . . Right?

We have used a combination of mastery learning[3] and personalized systems of instruction to prepare students for recall, understanding and application tasks.

Class Activities Include the Following:

1. Introduce the class as an exciting but very difficult course of study.
2. Sign a written grade contract with each student indicating that grades will be assigned for specific levels of performance. The student also signs the contract indicating what grade they are seeking.
3. Use two-member teams to work through cases and problems. One team member verbalizes the decision making process while the other team member encourages the verbalization process. Students alternate roles for the next case or problem. In this way, students learn to think through data and word problems and retain the skill of processing information correctly.[4]
4. Use the textbook's test bank to prepare two versions of each test the students are to take (two tests, 40 multiple-choice items each).
5. Use a Scantron grading machine to quickly score each version of the test. No grade is recorded until the student scores 80% or higher.
6. Students who score less than 80% complete correctives outside of class. They then exchange their old test, answer sheet, and correctives for another version of that particular test. They take the second test in class. We score it on the Scantron grader and give them the results as they come into the next class meeting.
7. After each first exam, we move on to new material during the next class meeting. Attendance increases because students cannot miss classes and complete their tasks. In addition, student attention and participation change dramatically after the first

test. Because students now recognize the importance of precise language in using economic terminology, they ask a good many clarifying and application questions in class. They want to be specific about the terminology and avoid doing correctives if possible. In the process they become active learners.

8. Class time consists of answering student questions about the reading assignment, showing application of concepts, and having them perform tasks--e.g., construct a demand curve, calculate elasticity of demand, or construct a field of indifference curves. For grading purposes, they complete daily application assignments which are turned in at the end of the term in a notebook.
9. To teach analysis, synthesis, and evaluation learning,[5] we require five position papers on topics such as "Was the 1993 Decision to Close U.S. Military Bases a Good Economic Decision?" We also require a major paper from each student explaining a particular U.S. corporation, its products, markets, and competition. This causes students to search for economic data from various media, making them more conscious of their existence as they form independent opinions about these market situations. Students determine what type of competitor their firm is by calculating a four-firm concentration ratio and determining if profits for the firm are normal or pure economic profit.

Using this approach we have found that the focus of the entire class is on learning economics and is more like a work environment than a typical classroom. Our job is one of encouraging, praising, clarifying, and assisting; we have become facilitators. Professor John J. Siegfried and William B. Walstad have found that students who indicated that they "like" economics do not learn more than other students. However, students who learn "more economics" will like the subject more. They advise instructors to find ways to teach more economics rather than worry about what students may think about the subject. If they are learning a great deal of economics, then the students will develop a greater "liking" of economics.[6]

Unfortunately for competitive society, the study of economics at the collegiate level has become a mandatory requirement of business, social science, and pharmacy students. As a required "service course," economics falls short of its potential which is to empower its possessor with the ability to think critically and make efficient decisions. By using EcSL as a teaching method in the first economics course, students will learn "more" economics and "like" what they have learned. My hope is that students will study economics to a greater degree on both the personal and institutional level which will have a positive impact in the aggregate for them and our society.

Notes

[1] Keynes, J.M. (1922) Cambridge Economic Handbooks New York, Harcourt, Brace, Introduction.

[2] Fels, Rendigs. (1984) Teaching Students How to Learn Economics, The Kentucky Journal of Economics and Business, Bellarmine College, Louisville, 5, 2-9.*

[3] Guskey, Thomas R. (1988) Improved Student Learning in College, Charles C. Thomas: Springfield, Illinois.

[4] Whimbey, Arthur and Lockhead, Jack (1986) Problem Solving and Comprehension (4th) Hillsdale, N.J., L. Erlbaum Associates, 22-27.

[5] Bloom, B.S. (1968) Learning for Mastery. (UCLA-CSEIP) Evaluation Comment, 1(2), 1-12.

[6] Siegfried, J.J. and Walstad, W.B. (1990), Research on Teaching College Economics, The Principles of Economics Course: A Handbook for Instructors, New York, McGraw Hill, 270-283.*

* The Fels article also appears as a chapter in The Principles of Economics Course: A Handbook for Instructors

References

Allen, Edward David and Valette, R.M. Classroom Techniques: Foreign Language and English as a Second Language, New York: Harcourt Brace Jovanovich, 1977.

Bloom, B. S. , Madaus, G. F. , and Hastings, J. T. Evaluation to Improve Learning, New York: McGraw-Hill, 1981.

Collins, Marva. Various interviews and material from the 1986 Current Biography Yearbook, 95-98.

Crowe, Richard. "ECSL: Teaching Economics As A Second Language, " ERIC Clearinghouse for Junior Colleges, UCLA, JC 920491 45 pp. March 27, 1992.

Crowe, Richard. "ECSL: Teaching Economics As A Second Language," Innovation Abstracts, Vol. XIV, Number 12, 2 pp. NISOD. University of Texas, Austin, April 17, 1992.

Eble, Kenneth E. The Aims of College Teaching, Jossey-Bass: San Francisco, 1983.

Epstein, Joseph (Ed.) Masters: Portraits of Great Teachers, New York: Basic Books, 1981.

Ericksen, Stanford C. The Essence of Good Teaching, JosseyBass: San Francisco, 1984.

Keller, F.S. Goodbye Teacher . . . Journal of Applied Behavioral Analysis, 1, 78-98, 1968.

Lowman, Joseph. Mastering the Techniques of Teaching, JosseyBass: San Francisco, 1984.

May, Scott. Interviews with Hazard Community College Spanish Professor, 1990 and 1991.

Moskowitz, Gertrude. "The Classroom Interaction of Outstanding Foreign Language Teachers," Foreign Language Annuals 9, No. 2 (April 1976) pp. 156-57.

Roueche, John. Various conversations and workshop presentations 1977-90. University of Texas at Austin; University of Kentucky, Lexington; and Hazard Community College (KY).

Weidenaar, Dennis J. "Marginal Improvements of Teaching," a workshop conducted at Cumberland College. Williamsburg, Kentucky, 1975.

Developing A Tool For Measuring Teacher Effectiveness

Veronica Free
University of North Alabama

Purpose

The purpose of the paper is to present the development of a methodology for evaluating teacher effectiveness at the University of North Alabama. The evaluation instrument developed is the result of a three year study and is currently being used as part of the university's promotion process.

Background

The University of North Alabama (UNA), formerly Florence State University, is a regional state university offering undergraduate and graduate degrees, serving both residential and commuting students. The main campus of the university is in Florence, Alabama and is part of a larger metropolitan area of approximately 140,000 people. Although the university became a State Teachers College in 1929, there have been few attempts to measure teaching effectiveness formally.

In 1990 a new President of the University recognized the need to establish a formal promotion policy and requested the faculty senate to appoint a committee to study such a policy. The procedure being used for promotion was nebulous and highly centralized. There was no formal process for student or peer input and little or no feedback was available to unsuccessful candidates. The faculty senate appointed seven faculty members to a committee to formulate a procedure for promotion, including the evaluation of teaching effectiveness. The author was elected to serve as chair.

Methodological Framework

Committee members compiled a list of other regional universities similar to UNA in terms of scope, mission, and size of student body. The promotion policy at these universities was studied. A comprehensive list of all criteria used to evaluate teaching effectiveness at these institutions was developed. UNA faculty were then surveyed, and using a modified Delphi approach, were asked to rank criteria they considered to be most important.

Criteria For Teaching Effectiveness

At most institutions, teaching represents one part of a "package" of overall faculty responsibilities. Traditionally, most teaching faculty are expected to perform university and community service and to perform some level of research. Teaching effectiveness was one component of an evaluation procedure that also included other university-wide responsibilities.

In addition to teaching effectiveness, the "Teaching Faculty Promotion/Evaluation Form" developed at UNA included evaluation of scholarly or creative performance and university and community service. There was a strong feeling from the faculty that, because of the diversity of their responsibilities, a catch-all category should be a part of the evaluation instrument (see Form A). From the comprehensive list of teaching effectiveness criteria developed from the other regional universities studied, there was general agreement that all these criteria could be "collapsed" into five areas:

a. Modification of course content, including but not limited to revision of syllabi, classroom activities, keeping abreast of changes in the field, and new evaluation procedures.

b. Development and implementation of new courses or areas of study or curriculum and/or innovative teaching methods.

c. Diligence in performing teaching responsibilities including, but not limited to, keeping regular office hours, meeting classes, timely grading and supervising of students, and timely distribution of course syllabi.

d. Evaluation of teaching as determined by any of the following: peer evaluations, alumni and student evaluations, evaluation by department chair, videotape samples of classes, or other evaluation procedures as determined by school and/or department.

e. Attendance at professional workshops, seminars, meetings, or additional coursework; membership and active participation in appropriate professional organizations.

Weighing Of Teaching In The Evaluation Process

At UNA, no faculty have only teaching responsibilities. Some faculty are more heavily engaged in research than others and there was a general feeling that those faculty should not have as heavy a weight in teaching as faculty who do not do much research. Similarly, some faculty are more involved in community and university service than others and they felt that there should be a weighing process that accounted for this. The resulting weighing process reflected the onsensus that the primary responsibility of the university was to teach. Hence, teaching should be the most important weight in the overall. Teaching was assigned an overall weight of not less than sixty percent and not more than eighty percent. The choice of the weights was left up to the individual faculty member. Scholarly and creative performance as well as university and community service each had a minimum weight of ten and a maximum of thirty percent. There was an optional category of "other" to include areas not covered elsewhere in the evaluation process (see Form A).**

Implementation

Implementation of the "Teaching Faculty Promotion/Evaluation Form" began in the Fall of 1993. Faculty applying for promotion voluntarily completed a self evaluation form which became part of their portfolio for promotion. The form was also completed by the department promotion committee which consisted of all tenured faculty members, not applying for promotion. Candidates were ranked for promotion according to their overall score by the school promotion committee. Members of this committee were elected by their respective schools. The Vice-President for Academic Affairs and the President review the portfolios of the candidates and the rankings as determined by each school and makes the final decisions regarding promotion. Feedback to unsuccessful candidates is accomplished via an instrument that indicated to the candidate what their ranking is in relation to all those who applied for promotion.

Summary And Implications

In an effort to recognize good teaching and to reward it, the University of North Alabama developed a "Teaching Faculty Promotion/Evaluaton Form" that is currently a part of the promotion process. After using the instrument for two years, there will be an automatic review process involving everyone who participated in the use of the form. Additionally, teaching seminars will be conducted so that faculty will have an opportunity to develop successful teaching skills.

**Dr. Morris Jones, University of North Alabama Professor of Management, designed Form A and developed the weighing process.

FORM A: TEACHING FACULTY PROMOTION/EVALUATION FORM

1. Teaching Effectiveness	Weight	Very Good (100)	Good (75)	Weak (50)	Very Weak (25)	Wgt. Score
a. Modification of course content, including but not limited to revision of syllabi, classroom activities, keeping abreast of changes in field, and new evaluation procedures.	20	20	15	10	5	
b. Development and implementation of new courses or areas of study or curriculum and/or innovative teaching methods.	20	20	15	10	5	
c. Diligence in performing teaching responsibilities including but not limited to keeping regular office office hours, meeting classes, timely grading and supervising of students, and timely distribution of course syllabi.	20	20	15	10	5	
d. Evaluation of teaching as determined by any of the following: peer evaluations, alumni and student evaluations, evaluation by department chair, video-tape samples of classes, or other evaluation procedures as determined by school and/or department.	20	20	15	10	5	
e. Attendance at professional workshops, seminars, meetings, or additional coursework; membership and active participation in appropriate professional organizations.	20	20	15	10	5	
					TOTAL AREA SCORE:	
2. Scholarly or Creative Performance						
a. Publishing, editing, refereeing, reviewing professional literature.	34	34	26	17	9	
b. Pure and applied research.	33	33	25	17	8	
c. Scholarly or artistic presentations, publications, performances, exhibitions. (non-refereed)	33	33	25	17	8	
					TOTAL AREA SCORE:	
3. University and Community Service						
a. Service to university, school, and/or department by service on committees, or in other assignments.	34	34	26	17	9	
b. Service to students through advising organizations or assisting with other student activities.	33	33	25	17	8	
c. Service to the community through consulting, civic groups, continuing education.	33	33	25	17	8	
					TOTAL AREA SCORE:	
4. Other (optional; identify)	100	100	75	50	25	
					TOTAL AREA SCORE:	

TEACHING FACULTY PROMOTION/EVALUATION SUMMARY FORM			
Place weighting preference in column 1 at right.	Overall Weight	Area Score	Wgted Area Score
1. Teaching Effectiveness (60% to 80%)			
2. Scholarly/Creative Performance (10% to 30%)			
3. University/Community Service (10% to 30%)			
4. Other (0% to 10%)			
FACULTY NAME:______________ OVERALL SCORE:	100		

Check One: ☐ Department Promotion Committee ☐ School Promotion Committee. If by committee, members must be listed on reverse side; underline chairperson. ☐ Self-Evaluation (optional) ________ ________________ (signature).

*N.B.: The weights for "teaching effectiveness," "scholarly/creative performance," "university/community service," and "other" shall be selected by each faculty member applying for a promotion within the ranges permitted on this form.

COMMITTEE MEMBERS

1.____

2.____

3.____

4.____

5.____

6.____

7.____

8.____

9.____

10.____

11.____

12.____

13.____

14.____

NOTE: Committee members are asked to initial their names, attesting that the average scores listed on Form A are derived from a summary of the individual ratings of the committee members.

The Impact Of Mandatory Attendance On Student Performance

Glenn Gerstner

St. John's University

Getting students to attend economics class on a regular basis can be difficult for any instructor. A recent article by Romer (1993) found that on an average day roughly one-third of all students are absent from economics class. When confronted with the issue, the pragmatic student replies that if we delivered exciting lectures, they would show up. To some extent that may be true, but we know that even the most dynamic professors find lots of absentees in their classes as well.

A potential solution is to impose on our students and insist that they come to class. A system designed to limit student absences is currently being used at St. John's University. Although the system is intended to discourage student attrition, this paper presents preliminary evidence that controlling attendance may have a positive impact on student performance as well.

The Problem of Absenteeism

At the primary and secondary school levels, a large body of evidence suggests that there is a strong relationship between student attendance and performance. Numerous studies have shown that an increase in the contact hours between students and teachers can result in a systematic increase in student achievement.[1] It follows that students who are consistently absent from school will be at a disadvantage. Since this relationship is reasonably well established, compulsory attendance is mandated by government and accepted by students, parents, teachers, and administrators.

60 At the university level, attendance is a different story. Once upon a time, during the early part of the century, colleges were often acting *in loco parentis* for the college student. Part of that function meant monitoring class attendance and punishing those who did not show up. Over the years, radical changes in the nature of higher education has forced administrations to the realization that college-age students could not be treated like children. Since the mid-1960's, regulations designed to control attendance have all but disappeared from campus (Enteman, 1979).

The modern university treats students like adults. The responsibility of coming to class lies with the student, as do the consequences associated with chronic absenteeism. There are two assumptions embedded in this philosophy: (1) that students are adequately motivated and

[1] A broad survey of this type of literature can be found in Rosenshine (1979).

responsible, and (2) that students perceive a positive relationship between attending class and a higher grade. Experience teaches us that these assumptions do not hold for many undergraduate students, particularly when enrolled in classes in which they have only a passing interest in the subject matter.

Is absenteeism a problem? That depends on who you ask. Most students would answer no, faculty would answer yes, and administrators might answer, "I don't know."[2] If Romer's data is accurate, few instructors would consider a 25 to 40% absenteeism rate in principles courses inconsequential. The challenge is how to deal with the problem. Should administrations implement university-wide policies of mandatory attendance? Should instructors design there own schemes to discourage absenteeism? Or should we ignore this issue altogether, since any attendance regime will be described by the student body as infringing on students' rights and freedoms? The following section provides a potential solution.

An Example of an Attendance Policy

St. Vincent's College (SVC), the largest undergraduate unit of St. John's University, has utilized a system which controls student absenteeism for more than twenty years. The SVC student body is comprised of two distinct populations: four-year students in a variety of majors and two-year students majoring in business or other associate degree programs.[3] The four-year program attracts many well-prepared enrollees with outstanding high school records, but at the same time the College tries to admit many marginal students to the two-year program who otherwise may not meet the more demanding entrance requirements of other units within the University. These students are offered remedial coursework and tutoring designed to get them "up to speed" with the rest of the student body.

The diverse student body presents SVC with a problem. Since these marginal students are less academically prepared relative to the "average" student, they may struggle to perform satisfactorily, especially in the freshman year. Coupled with the fact that St. John's is almost exclusively a commuter university, the threat of widespread student attrition is a real possibility. In an effort to reduce the probability of student attrition, the founders of SVC established procedures designed to monitor student attendance. The guidelines are straightforward:

St. Vincent's College expects all students to take full advantage of their educational opportunities by regular class attendance and to assume the academic risks incurred by absences . . . All freshmen and sophomores who have been absent nine hours from a three semester hour course or . . . twenty percent of total contact hours may be denied credit for the course.

Although no formal system of class attendance will be maintained for juniors and seniors in good academic standing, a faculty member may set forth such standards for the satisfactory conduct of the course. (*1993-1995 Undergraduate Bulletin*)

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[2] Hopefully *not* followed by, "and I don't care."

[3] The most popular four-year programs include communication arts, athletic administration, criminal justice, computer science and health care administration.

These regulations effectively cap the absenteeism rate at 20%. Students who exceed this limit may be denied credit for the course at the discretion of the instructor.[4] From the administration's perspective, these attendance regulations have the desired effect: it effectively reduces student attrition. Absentees can be identified and shepherded back to class and on to successful completion of their programs. Without such personal contact, many of these students would never return to class and end up dropping out altogether.

In these days of declining enrollments, faculty members are surely interested in retaining students as much as administrations are. But as instructors, there is another potential benefit of mandatory attendance: Since students attend class regularly, they learn more and attain higher grades. It is this hypothesis that the rest of this paper examines.

Models of Student Performance

There have been numerous studies which have attempted to model the performance function of an economics student. Student performance is usually described as some function of a student's natural ability and skills, motivation, and other endogenous characteristics. The dependent variable, performance, is usually defined as the student's final grade in the course, although it could be the score on a standardized exam such as the TUCE. Measures of ability can include SAT, ACT, and/or TUCE scores, previous economics exposure, prior GPA, or high school rank. Motivation may be measured by the number of hours studied, attendance, or completion of homework assignments or problem sets. Endogenous characteristics could include a variety of endogenous variables, such as the student's age, gender, major, or class. Exogenous variables such as the instructor, classroom atmosphere, and time of day of lecture would not be appropriate in the student's performance function, but are variables that are often measured and tested to ensure that they do not compromise the results.

There are three serious problems that must be considered when developing models such as these. First, there may be a measurement problem, particularly with the motivation variables. For example, study hours must be reported by the student. This may create some self-selection bias: Students who study very little or not at all may be reluctant to report such information. Also, unless taken every day, attendance must be based on sample data, which could lead to measurement error. Since these are problems that cannot be easily rectified, many studies do not include these variables in the performance function.

The second problem, a somewhat technical one, has to do with the nature of the performance measure. Since the measure of performance is usually the student's final grade in the course (A, B, C, etc.), the dependent variable in the regression is qualitative. If this is the case, an OLS estimation is inappropriate because of the underlying assumption that the dependent variable must be continuous (Park and Kerr, 1990). This problem has been corrected by replacing OLS with another estimation method, such as probit analysis (Spector and Mazzeo,

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[4] It should be stressed that following such guidelines are *purely optional on the part of the faculty member*. It is my experience that most of my colleagues require our students to adhere to the attendance policy.

1980), tobit analysis (Leppel, 1984), or a multinomial logit model (DeCanio, 1986; Park and Kerr, 1990).

The third problem is the most troubling. Many independent variables -- prior GPA and SAT scores, for example -- are highly correlated. Identifying the impact of individual variables can become difficult, if not impossible. Multicollinearity can be dealt with using traditional methods (stepwise or ridge regression), by aggregating correlated independent variables (Schmidt, 1983), or by "filtering" independent variables by prior regression and inserting the residuals in final regression (Park and Kerr, 1990).

Empirical Analysis

The data for this study was collected from two instructors' Principles of Economics I classes from the fall 1990 through the spring 1993 semesters. The first principles course was chosen as to eliminate factors such as a student's previous economics coursework (there would be none) and the degree of mathematical sophistication needed for successful completion of the course (there would be little).[5] To further normalize the data, only sections which met three times per week (Monday/Wednesday/Friday) during the day were included.[6] This yielded a sample of 510 observations, which included the number of times the student was absent and the student's final grade in the course. Class rosters were examined to identify each student as two-year or four-year for inclusion as a dummy variable.

Both instructors kept detailed records of student attendance. Latenesses were not included, since it is impossible to determine the actual amount of class time missed. The instructors also used a similar grading scheme: The student's final grade was the arithmetic average of several semester exams (three to five) and the final exam. This yielded a percentage grade (0-100) which was in turn converted to a letter grade using the following scale: 90-100=A, 85-89=B . . . 60-64=D and <60=F. Class attendance did not directly influence the final grade.

The mean absenteeism rate for the total sample was about 12% (Table 1). This can be contrasted with Romer's survey which indicated absenteeism rates of 25-40% in principles courses. An examination of the frequency distribution of the absentee rates of individual students (Figure 1) shows that a majority of the students are absent less than 10% (four hours) of the time during the semester. This skewness implies that when student data is aggregated, the size of the mean absentieeism rate is due to a few students being absent often.

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[5] Romer (1993) found that absenteeism was much lower in courses with significant mathematical content.

[6] Although I am unable to produce empirical evidence to back up these observations, it is my opinion that student performance is somewhat "differently" when (1) the lecture is delivered in 1 1/2 hour or 3 hour segments, and (2) the class is predominantly comprised of non-traditional students (evening sections). Maybe a future study can investigate what these "differences" are, if any.

Figure 1
Histogram - Student Absences

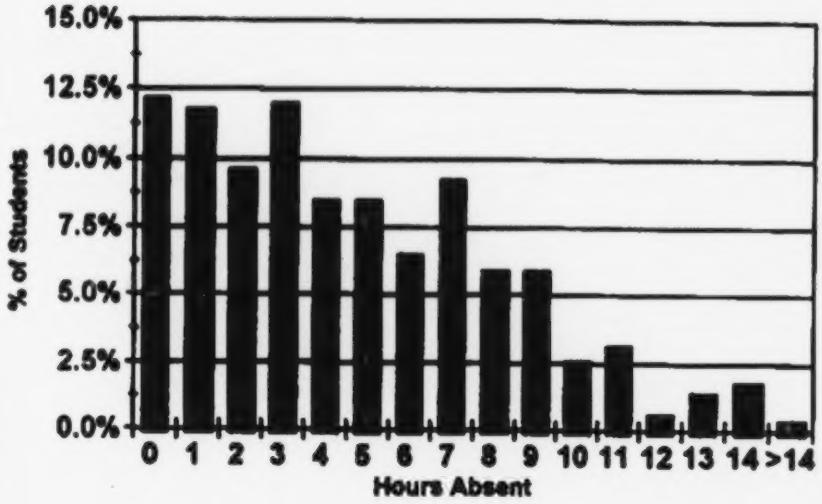

Table 1
Descriptive Statistics

	Prof. A	Prof. B	Total
Observations	282	228	510
Mean Class Size	47.0	45.6	46.4
Absenteeism Rate			
Mean	10.7%	13.6%	11.9%
Standard Deviation	8.8%	9.1%	9.3%
Final Grade			
Mean	78.4	77.8	78.1
Standard Deviation	11.5	10.6	11.1

The similar grading regimes of the instructors yielded virtually identical grade results. Although Professor A graded slightly higher with somewhat greater dispersion, a two-tailed test indicates that these differences are insignificant (t = 0.612). There is, however, a substantial difference in the mean absenteeism rates (t = 3.602). This may indicate that attendance may depend on certain characteristics specific to individual instructors or the way they conduct their classes. Such characteristics might be able to be identified via detailed student surveys, but the possible reasons for the differing rates of attendance will not be speculated on here.

To measure the impact of attendance on performance, the following regression equation is employed:

$$\text{GRADE} = \boldsymbol{a} + \boldsymbol{b}_1\,\text{ABSENCE} + \boldsymbol{b}_2\,\text{CLASS}$$

where: GRADE = student's final grade for the course (0-100)
ABSENCE = number of hours absent during the semester
CLASS = dummy variable (0 = 2-year student and 1 = 4-year student)

This simple model is used for the following reason: Both Schmidt (1983) and Park and Kerr (1990) measured a number of endogenous variables (such as major, gender, age, etc.) but found that only prior GPA, SAT/ACT scores, and attendance were significant. After further in investigation, both found that attendance and performance were related *even after these variables were controlled for* (this was confirmed by Romer). The CLASS dummy is included primarily to satisfy the professional curiosity of the St. Vincent's College faculty -- are our two-year students at a substantial disadvantage relative to our four-year students?[7]

The various problems associated with modelling student performance have been considered in the construction of this model. Since both instructors took attendance every day, there should not be any measurement error for the ABSENCE variable. GRADE is expressed as the arithmetic average of the student's exam before it is converted to a letter grade. While not theoretically continuous, this measure of performance is better suited to an OLS model than a letter grade measure. Finally, multicollinearity is not an issue, since it is unlikely that the two independent variables are correlated.

The regression analysis (Table 2, column 1) results in the expected signs for both independent variables. ABSENCE is negative and significant at a 99% confidence level. The CLASS variable is positive but it not significant. The regression was run again without the CLASS variable (column 2) with almost identical results, suggesting that the class of the student has little impact on performance. That's the good news. The bad news is that despite the positive relationship between attendance and performance, attendance itself is accounting for less than 5% of this variation (R^2 = 0.047). On the surface this appears disheartening, but it might be a result that makes the case for mandatory attendance.

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[7] This procedure of "integrating" two-year and four-year students in the same courses and sections raises an occasional eyebrow (usually from an accrediting body). The preliminary data collected here indicates that eyebrows should remain lowered for the time being.

Table 2
Regression Analysis

	(1)	(2)
Constant	81.3461	81.3972
ABSENCE	-0.6642 (4.987)	-0.6624 (4.999)
CLASS	0.1410 (0.145)	-------
R^2	0.047	0.047

Notes: Absolute t-ratios are in parentheses
Column (1) includes dummy variable CLASS
Column (2) excludes dummy variable CLASS

Conclusions

The data confirms previous studies which indicate a significant inverse relationship between absenteeism and student performance. The low coefficient of determination (0.047) suggests that although the relationship exists, the causality of the relationship is not being captured by attendance alone.

This low R^2 may provide evidence that controlling student attendance may effectively remove absenteeism as a determinant of student performance. When using the same regression equation as in Table 1, column 2, Romer (1993) reported a coefficient of determination of 0.31. When attendance is strictly voluntary, the number of lectures attended can become a relatively important part of the performance function. In this study, keeping absences limited may have reduced the direct effect of attendance on student performance. Make no mistake -- attendance and performance are still linked -- but the relationship is being captured by unobserved variables, such as prior GPA, SAT scores, and the like. It is quite possible that students who may be observed as "outliers" when attendance is not controlled -- students who miss 50% or more of the lecture hours, for instance -- are removed from the sample when attendance is controlled.

We must be cautious, however. It could be a matter of apples and oranges -- Romer collected data from highly competitive (second of six tiers according to *Barron's Profiles*) schools. Most SVC students, be they two- or four-year candidates, represent a different breed of student. The only way to prove the hypothesis that mandatory attendance can remove the variation in performance due to absenteeism would be to conduct an experiment in which a control group and an experimental group take the same course with the only difference being the section's attendance polices.[8]

The results suggest the two research agendas: First, a replication of this study with a more robust data set including variables such as prior GPA and SAT scores. A better-fitting model may be able to more accurately identify specific factors which influence student performance. Second, as outlined above, controlled experiments designed to measure the impact of absenteeism on student performance may be useful as well. Evidence suggesting that excessive absenteeism impedes the ability of students to effectively master material may lead some schools to reexamine their institutional attendance policies. For the interested reader, the appendix contains an overview of the how the St. Vincent's College attendance policy is administered, as well as some of the pros and cons of such a regime.

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[8] This is suggested by Romer (1993), along with an explanation of the potential complications.

References

DeCanio, S.J. 1986. "Student Evaluations of Teaching: A Multinomial Logit Approach." *Journal of Economic Education* 16 (Summer): 165-76.

Enteman, Willard F. 1979. "The Integrity of the Student: A Normative Approach, " in Clarence Walton and Frederick deW. Bolman, eds.: *Disorders in Higher Education*. New York: Prentice-Hall.

Leppel, K. 1984. "The Academic Performance of Returning and Continuing College Students: An Economic Analysis." *Journal of Economic Education* 15 (Winter): 46-54.

Park, Kang H. and Peter M. Kerr. 1990. "Determinants of Academic Performance: A Multinomial Logit Approach." *Journal of Economic Education* 21 (Spring): 101-111.

Romer, David. 1993. "Do Students Go to Class? Should They?" *Journal of Economic Perspectives* 7 (Summer): 167-174.

Rosenshine, Barak V. 1979. "Content, Time, and Direct Instruction," in Penelope L. Peterson and Herbert J. Walberg, eds.: *Research on Teaching: Concepts, Findings and Implications*. Berkeley, CA: McCutchan.

Schmidt, Robert M. 1983. "Who Maximizes What? A Study in Student Time Allocation." *American Economic Review* 73 (May): 23-28.

Spector, Lee C. and Michael Mazzeo. 1980. "Probit Analysis and Economic Education." *Journal of Economic Education* 11 (Spring): 37-44.

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Appendix

How An Attendance Policy Works

The attendance regulations in place at St. Vincent's College (SVC) are simple (see page 3). Unfortunately, administering and enforcing those rules fairly and consistently is not. This appendix is designed to provide some practical insight into how one attendance policy works, along with the potential complications that might arise. We do not profess to have "the" perfect attendance policy, but may provide an initial framework for an institution considering the implementation of an attendance policy. Regardless of the mechanics, it can be stated with some certainty any policy will be unworkable without the cooperation and effort of both faculty and administrators alike.

The process begins with the instructor. Faculty must take attendance every day (or almost every day) to accurately track student absenteeism. Since the outer limit of class size in SVC is about 60 students, calling the roll at the beginning of class does not take up too much time.[9] There are two signals that will provoke action: if a student has been absent for several consecutive classes (in a class that meets three times a week, four is a typical cutoff), I will send an informal memo to the SVC Dean's office requesting that contact be made with the student. An assistant dean will usually phone to student and try to ascertain the reason for the absence and then inform the instructor of whether or not to expect the student's return. Most of the time, the student is sick and was unaware that common courtesy would indicate a phone call to inform the instructor of the problem. The other sign is a large number of absences -- if we are four weeks into the semester and a student has missed six or seven classes, there is a high probability the student will become over cut at some point during the semester. At this point, I will ask the student to see me after class and the issue of excessive absences will be discussed. More often than not, the student has a relatively lame excuse and my reiteration of the attendance regulations (that if the student is over cut he or she will be withdrawn) is enough to correct the student's attendance problem.

This second situation can also introduce that dreaded "grey area" of any rule enforcement procedure. Sometimes, the student has a legitimate reason for being absent so often. If the student can (to my satisfaction) document reasons why consistent class attendance may be impossible, I will choose to waive the 20% limit on absences. This is *always* made with the proviso that the student's future performance meets some predetermined level -- usually a C average or better. In effect, what I'm telling the student is she can stay in class, regardless of attendance, as long as her performance is acceptable.

The biggest headache in administering the attendance policy can come after the student has been officially withdrawn. When a student is absent nine hours without good reason, I send a form to the Dean's office requesting that the student be withdrawn from the class due to excessive absences. SVC sends the student a letter to that effect, and then communicates with the Registrar's Office as to record a grade of "WD" for the student. If the student doesn't care, the WD is accepted and that's the end of it. But when the student doesn't want to be withdrawn, he or she will come into the Dean's office requesting reinstatement.[10] The student will be required to substantiate the excessive absences, and then must go to the professor personally to be readmitted to the course. The final say on reinstatement lies with the professor -- but in practice, if the Dean's office accepts the reason for reinstatement, I will concur with their determination and permit the student to reenter the class. It is this situation which causes us (faculty and administrators) the most grief -- and the most paper. Follow the process: I send a note to the Dean, "Please withdraw Smith from my class;" SVC then sends a note to Smith, "You're out;" and a note to the registrar, "Please record a grade of 'WD' for Smith." When Smith asks for reinstatement, the Dean sends a note to me, "Do you want to reinstate Smith?;" I send a note back to the Dean, "Reinstate Smith;" the Dean sends a note to the registrar, "Erase that 'WD' for Smith;" and a note to Smith, "You're back, but don't be absent again."[11] You get the idea -- this huge paper trail and extra work for all involved because, in reality, the student didn't know that being over cut would result in a withdrawal in the absence of a reasonable excuse.

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[9] Not all instructors may use the same techniques outlined here; that is the reason for the first person narrative. For example, some instructors choose to pass out an attendance sheet, but I personally find calling the roll helpful in learning individual students names. Even in a class of 50, by the third week I can at least associate the face with a name without any extra effort on my part (such as seating charts or studying ID photos).

It is this final scenario that turns many off to the idea of taking attendance and developing institutional policies about attendance. Despite the extra effort involved, I firmly believe that an attendance policy is worthwhile -- because in the end, whether they know it or not -- the policy helps the student.

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[10] It is amazing that some of our students are able to learn from us at all, since students must not believe a word we say. I never withdraw a student without warning him or her that if nine absences are recorded, he or she will be dropped. Then when I follow through, the student can't believe that I actually did what I said I would do. In effect, some students never believe that we will drop them due to excessive absences.

[11] Much of this communication could be handled verbally, but written correspondence provides more solid documentation should the student (or the professor) try to revise history during the appeal of a decision.

Microeconomics And Total Quality Management

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Introduction

Total Quality Management (TQM) shares many assumptions and concepts with microeconomics. This paper discusses how TQM concepts can be incorporated into the introductory microeconomics course. The objective is to enhance the presentation of microeconomic concepts.

TQM concepts are compared to microeconomic concepts for similarities and differences. These comparisons then form the basis for suggestions on how TQM can add value to the presentation of microeconomics, especially for business majors.

Similarities

1. Microeconomics assumes that the ultimate objective of economic activity is consumer satisfaction. So does TQM. In TQM, the definition of quality is not determined by engineers or statisticians but by customers. What TQM calls quality economics calls value or net benefit, the ratio of benefits to the consumer to the price (or cost) of the product.

2. Both strongly believe that changing incentives will change behavior. A large part of the TQM approach is to devise incentives for all employees to cooperate and contribute to improvements in productivity. TQM gurus such as Deming condemn current management performance review and reward systems as leading to management decision-making behavior detrimental to the long-run success of the organization. TQM thinking puts emphasis on human resource strategies that overcome the principal-agent problem and implicitly supports the profit-maximization assumption.

3. More than most management approaches, TQM stresses the importance of data as the basis for making decisions. TQM emphasizes quantifiable variables, as does economic theory. Both believe that ideas and strategies have to be tested with data. Both view economic systems as information feedback mechanisms that lead to adaptive behavior.

4. Combining 2 and 3 gives the assumption that managers can make rational decisions based on a clear set of objectives and sufficient information.

5. Both TQM and microeconomics look behind financial figures to the efficient use of real resources. What counts for both is that increasing productivity over time is the only basis for rising standards of living and a major source of competitive advantage. Both aim to develop strategies that result in more output from the same amount of input through better

use of resources. Both believe that new technology, including better ways to organize production, is an important source of greater efficiency.

6. Both microeconomics and TQM assume that long-run competition is dynamic. Companies engage in continuous competition based on price and quality of the product or service. Competition forces companies to continuously look for ways to reduce cost, improve quality, come up with new products or new ways to organize internal processes (the production function in economics).

7. Microeconomics and TQM are interested in the boundary between a company and the market. How does a company decide the degree of vertical integration? Should a company produce its own parts and subassemblies or buy them from other companies? If so, what is the relationship between purchaser and supplier?

   This gets to the heart of the concept of transaction costs and the relative merits of the market vs. hierarchy.

   The relationship between Japanese car assemblers and their major suppliers has cast doubt on the simple alternatives presented in economic textbooks. The *keiretsu* relationship seems to capture most of the advantages of vertical integration without the large capital investment, bureaucratic structure or risk. Much of the business risk has been shifted to the suppliers in exchange for reducing the supplier's overall risk.

8. Both are oriented towards the external environment of the firm. Both emphasize the key role of consumer choice, the relationship between company and suppliers, and the constant pressure from competitors to innovate and become more productive. Both think in terms of economies and diseconomies of scale, and the learning curve for an organization.

Differences

1. TQM and related strategies like *kaizen* seldom do an explicit cost-benefit analysis or estimate the marginal cost/marginal benefit of pursuing productivity-increasing strategies with diminishing returns. It is usually assumed that the benefits of any strategy or suggestion that reduces defects, inventory or tolerances, or increases productivity, is worth the cost.

2. Economics emphasizes the large increases in productivity from the economies of scale based on specialization. TQM emphasizes the diseconomies of scale due to the coordination costs of managing specialized resources organized along functional lines. This problem is considered especially acute in the area of new product development.

   There is, however, a convergence of interest in the role of transaction costs as a source of diseconomies of scale.

3. Economic theory assumes a stationary short-run marginal cost curve. TQM contains strategies to reduce a company's short-run marginal costs.

From "Production Function" To "Process"

The first borrowing from TQM expands the concept of "production function" to that of "process." The production function will no longer be a "black box" to students. The production process can be divided into inputs (such as raw materials and raw data) and components (such as labor, machinery, and software). This division makes sense to students with corporate experience. It focuses attention on the importance of management decision-making and improving organization as a means to increasing productivity and reducing cost. A discussion of the economics of a "process" could lead to presenting better organization as an alternative to increasing capital investment or a comparison of the costs of organizing the production process with buying intermediate goods and outside services like subcontracting. Introducing the idea of "process" also lays the foundation for a later discussion of the economics of organization, vertical integration and transaction costs.

TQM And Consumers Choice

The TQM definition of quality as the basis of consumer satisfaction can be translated into the economic concepts of opportunity cost and expected benefits. These concepts, in turn, are the foundation of the analysis of individual demand curves.

Consumer satisfaction is based on expectations about the performance of the product. Expectations can change over time as the consumer obtains more experience and information about the product and competing products. Changes in expectations will shift the consumer's demand curve for the product.

Opportunity cost says that the total cost of a product is its price plus the value of any other scarce resource the consumer has to give up. Some examples of added cost might be the time and cost of excessive servicing; living with substandard performance; the time, expense and aggravation of excessive repairs; and the time and aggravation of trying to decipher assembly and use instructions. If the opportunity cost of a product or service turns out to be substantially greater than expected, it is likely that the consumer will buy less of the product even at the same market price. Even worse for the producer, the unhappy consumer will attempt to recover part of the high opportunity cost of the product by deriving pleasure from telling everyone what a lousy product it was. Bad news for the level of future demand.

The TQM idea of quality could by made an important part of the economic idea of expected benefits. Quality is the opposite of the components of opportunity cost. Part of a quality product are the expected benefits of easy-to-read instruction, minimal servicing, good performance, consistency, reliability, and few repairs.

Thinking about quality is a way to explicitly incorporate the dimensions of time and risk into decision-making. Introducing time and risk as part of a consumer's decision-making is more effective than waiting until the discussion of investment. All students have had experiences where products did not meet their expectations (the basis for later topics such as uncertainty because of incomplete information and the risk of getting a lemon) or there were unanticipated future costs because of poor quality.

Consumers learn about the relative quality of products over time and this affects future consumption decisions. One way to view the demand curve for a product is as a range of anticipated values estimated by consumers. Value depends on comparing the quality (expected benefits) with the opportunity cost of a product. Improving the quality of a product more than the cost increases its net value, and should increase its demand. Improving quality might also make demand for a product more inelastic.

A discussion of consumer behavior that emphasizes the relative quality of products should suggest to business majors that a company might be able to develop a long-term competitive advantage if competitors can not duplicate quality improvements or continually lag behind in innovating quality. The example of Toyota vs. General Motors should be instructive, or at least trigger a few car-buying horror stories.

Another possible branch from the explanation of the idea of quality might be the consequences of increased market share. As output is increased, potential production economies of scale lower unit cost. If price is also lowered, unit sales and market share increase. There may be marketing economies of scale (the brewing industry is always a popular example). In addition, continuous attempts to improve quality could further lower production and distribution costs by reducing defects, rejects, seconds, warranty and recall costs, returns and rework expense. All this adds up to a long-run strategy of increasing value to consumers, rising market share, rising sales and rising profit margins. Economists like this strategy because it emphasizes innovation, more efficient use of resources, and greater value (net benefits) for consumers.

Improving quality is one source of non-price competition. It is the heart of one possible long-run strategy. Improving quality is one way to develop loyal customers, an effective deterrent to new entrants.

TQM And Short-Run Cost Curves

The concepts of production possibility frontier and production function imply a critical objective of corporate management. Microeconomic theory assumes best technology and organization but an important managerial function is to improve the productivity of the company. This means either producing the same output using fewer inputs or producing more output with the same inputs or producing higher quality output with the same inputs. Students learn that cost reduction does not mean just firing employees, but a decrease in the amount of inputs per unit of output.

The short-run strategy to reduce real costs is to constantly look for improvements in manufacturing (or the providing of services), distribution and marketing. One of the basic ideas behind the Total Quality Management (TQM) approach that is transforming management of large corporations is that improvements in efficiency, productivity and safety are ongoing company-wide activities that involves all employees, not just management and specialists. This approach in turn implies radically different policies in the areas of hiring, training, information flows, and the role of management.

In the short run, the benefits of a continuous improvement program, called *kaizen* in Japan, are not obvious and sometimes difficult to quantify. But the long-run cumulative effect can be spectacular. Toyota, which has had a *kaizen* program since the early 1960s, today produces the highest-quality cars in the world as substantially lower real cost (less labor, capital, inventory and space per car) than any American or European company. American companies, especially Ford, have adopted some of the management strategies of Japanese car companies, and are closing the gap in quality and cost.

TQM And Long-Run Investment

A critical assumption that should be congenial to economists is that employees should be seen as long-run human capital with firm-specific skills, rather than a source of short-run variable cost. TQM, particularly the writings of Deming, stresses the importance of investing in employees and internal systems compared to physical capital. Unlike most capital equipment, produced by specialized capital goods companies and available to all, superior organization and management can a source of competitive advantage if the result is superior quality and service.

A firm will also be less likely to react to a cyclical fall in demand by firing employees if the company has made a long-term investment in its employees and expects an increasing return on that investment as its employees gain in experience, training and the TQM mentality. This implies that matching production and demand, and not carrying large inventories, are important strategies. At this point, the professor can mention that the sales forecast, using esoteric techniques known only to highly-skilled economists, is critical to the success of this set of strategies.

Diseconomies Of Scale

Microeconomics presents economies of scale as the basic idea in long-run production. Whether or not there are economies of scale determines the shape of the long-run average cost (unit cost) curve. Yet, unless your students become industrial engineers, they will be more concerned with diseconomies of scale. In fact, as a future manager, they might be one of the reasons for diseconomies of scale.

Diseconomies of scale occur when an organization sees its average cost rise as it grows. The main source of diseconomies of scale is the way large corporations (and other institutions) are usually organized. Based on the ideas of specialization and division of labor, large corporations are made up of departments and groups of specialists, including "professional" managers who manage other managers. Because of the increasing fragmentation of work and information processes as the organization becomes more complex, more "overhead" functions of supervision, control, accounting, auditing, information analysis, and coordination are needed. Procedures become more complex as they have to handle increasingly diverse situations. All of this increases coordination costs, slows up internal decision-making and delivery of services to customers, and stifles innovation. Managers and professionals find that they are spending most of their time handling and analyzing information, going to meetings and writing memos in response to other memos, rather than adding value to the company's products or services.

A more creative approach has been the attempt to eliminate many of the internal transaction costs that lead to diseconomies of scale. One way is to combine a number of jobs into one so that paper-shuffling between departments is eliminated. Another is to centralize information in a relational database so that the data is entered once and all departments have access to it. In effect, this substitutes software for people. A third way is to give more decision-making responsibility to the person doing the work, particularly employees in contact with customers. A fourth is to train employees to do their own analysis and quality control, an idea that is central to the thinking of Total Quality Management. It is even possible to combine some of these approaches for even larger increases in productivity. (See Michael Hammer and James Champy, Reengineering the Corporation, for more detailed strategies and examples on how to overcome diseconomies of scale.)

Unlike most planning systems that are based on budgets and long-run financial objectives, TQM says nothing about "acceptable" performance. Economics also implies that meeting financial goals cannot be the main objective of management because financial performance depends on industry structure and the changing external environment. Economics implicitly stresses adaptability and flexibility as the hallmarks of management decision-making.

Conclusion

Some of the ideas of TQM and related management approaches can be used to enhance and enrich microeconomic theory. Modern microeconomics often discusses an economic problem without offering specific decision-making strategies to solve it. Some examples are the principal-agency problem of motivating employees, diseconomies of scale due to coordination costs, the problem of transaction costs, and adverse selection of new employees. TQM addresses many of these same issues and attempts to come up with a coherent set of strategies to deal with them.

I have found it possible to introduce some of the ideas of TQM in my basic microeconomics course. I believe that TQM concepts help to link microeconomic theory with business management courses. TQM adds value to microeconomics, especially for business majors.

Designing Controversy: Enhancing Higher Order Thinking about Economics and Social Work.

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I. Introduction

In 1993, St. Cloud State University offered faculty an opportunity to work as teams to modify and teach courses in an initiative aimed at maximizing "higher ordered thinking." Cross disciplinary teaching teams were perceived as a particularly appropriate means of enhancing the process of classroom education.

Benjamin Bloom's taxonomy of learning describes cognitive skills which build from the comprehension of knowledge to its application, analysis, synthesis and evaluation. The pedagogical concept described as "higher ordered thinking" is similar to Bloom's "synthesis" level as it requires the learner to put together elements to form a whole or to constitute a structure previously absent.[1] Other research in higher education has suggested four dimensions of learning: declarative (learning what), procedural (learning how), conditional (learning when and where), and reflective (learning why) In this scheme, higher ordered learning resembles conditional learning which entails developing judgment and knowing when and where to use particular knowledge to greatest advantage.[2]

With the goal of developing and supporting such thinking in the classroom, assistant professor Nathan Eric Hampton from the Department of Economics and associate professor Beverly Stadum from the Department of Social Work, applied to design and team teach Economics of Urban Policy -- a course offered yearly by the Economics Department to students who are primarily majors in Local and Urban Affairs. The disciplines of Economics and Social Work share concern about "efficiency" versus "equity" as the goal of solutions to urban economic problems. Economics specializes in the former at the expense of under emphasizing the latter, whereas Social Work is accused of doing the opposite. In addition, to this difference, we stand far apart on the political spectrum; previous informal conversations had revealed disagreement on professional issues including: the costs and benefits of government intervention, the degree to which individuals can act in their own best economic interest, and the existence and ramifications of economic class structure.

While Economics of Urban Policy traditionally emphasizes market-oriented (i.e. efficiency) models, as a team we proposed to emphasize disciplinary differences to highlight for students alternative ways of examining and solving urban problems.[3] Analyzing a problem from other than a traditional perspective is normally referred to as "critical thinking," but "higher ordered thinking" requires recognition and application of two or more alternatives as well as integration or synthesis of these alternative approaches into a more comprehensive (and possibly more complex) approach. Within this course, the political nature of urban problems and their solutions was intended to provide students an opportunity to apply economic and social work theories to "real world" situations, and thus develop higher ordered thinking skills.

The next section of this paper describes the course syllabus and student assignments. Following that is a discussion of the means used to assess students' recognition, understanding, and application of higher ordered thinking skills.[4] This includes analysis of objective data from a pre-test and post-test of knowledge and attitudes given the first and last day of class, and analysis of qualitative responses from a comprehensive end of quarter course evaluation.

II. Team Teaching Strategy - Creating the Opportunity for Higher Ordered Thinking

Designing the Economics of Urban Policy course as a team taught course required revision of its syllabus to highlight discipline-related differences Four overall goals were established, that students (1) recognize that each academic discipline has its own perspective, (2) understand why conflict exists in contemporary public discussion, (3) think critically when selecting theories and models for explaining and improving our shared social existence, and (4) see themselves as citizens and future professionals effectively participating in analyzing urban issues.

The vehicle for learning was a classroom process that included lectures, small and large group discussion, essay examinations, and student presentations. The assigned textbook excerpts and journal articles focused on economic theory, public policy analysis, poverty, and health care. These readings highlighted divergent theoretical paradigms that lead to divergent conclusions in solving problems in public policy.

As originally taught, the course included basic microeconomic principles, location theory, and the theory of public taxation and expenditure which had been applied to issues such as poverty, housing, transportation, and environmental needs. The revised team taught course clearly remained an economics course; however, location theory, public taxation and expenditure policy were eliminated and replaced with a section covering alternative models in public policy development. The time spent on application of theory was expanded, but the topics were narrowed to only two: low wage employment and health needs in the urban setting. Three of the 10 weeks covered basic microeconomic theory (e.g. efficiency, supply and demand, modeling, incentives, market failure, and public choice) and a subsequent two weeks covered policy analysis (e.g. distribution of resources and rewards, policy agenda, policy formation, communication of constituency demands, etc.).

These sections were theoretical in content but provided examples which foreshadowed the application of theory to poverty and health care issues with attention to the sources of market failure. Instead of concentrating solely on the efficiency aspects of various urban policy as in the past, the course now considered more fully the equity (i.e. distributional) aspects of urban public policies.

Students were required to participate in a policy issue/dispute in local government to enable a first hand observation of the above ideas. To this end, students were required to attend a public meeting (i.e. city council, zoning commission, etc.) and develop a written analysis including problem definition, determination of interest groups, progress of the issue through the political process, and efficiency or equity as part of the problem solution.

A portfolio collection of urban policy issues in the print media was also required of each student. This assignment was to familiarize students with the media's discussion of urban policy, the content and analysis of prominent contemporary issues. Selected articles had to relate to urban economic theory or policy process, be correctly cited and summarized. Specifically, each portfolio included at least one example of: policy for health care reform nationally, correlation of poverty with poor health, a conservative proposal to address urban poverty or unemployment, a liberal proposal for the same, and discussion of adjacent urban issues such as housing, transportation, education.

III. Assessment

As part of the team teaching initiative, faculty were encouraged to develop processes for assessment. One resource for this was the Classroom Assessment Techniques: A Handbook for College Teachers by Thomas Angelo and K. Patricia Cross. Twenty-seven techniques are offered for assessing course-related knowledge and skills.[5] The authors divide these further into techniques for assessing prior knowledge, recall, and understanding; skill in analysis and critical thinking; skill in synthesis and creative thinking; skill in problem solving, and skill in application and performance. Nine of these techniques were included within the assessment processes applied to the Economics of Urban Policy; additional techniques may have revealed even more about the attempt to develop higher ordered thinking.

On the first day of class, a pre-test required students to report on their prior background in economics or social work classes. Four open-ended questions went on to ask students: (1) what they think professional economists and social professionals have in common, (2) how the two professions differ, (3) how economic theory contributes to the study of urban issues, and (4) how a social work/welfare perspective contributes to the study of urban issues.

Six true/false questions followed; these stated: (5) studying theories is more appropriate for graduate than for undergraduate education, (6) the most important factor in creating policies affecting health care is affordability, (7) with creative leadership cities can effectively improve the employment opportunities in their area, (8) efficiency is the most important consideration for determining if a policy is good or bad, (9) equity is the most important consideration for determining if a policy is good or bad, and (10) since markets benefit the strong over the weak, the government is the most effective way to give people the things they need at affordable prices. The same questions were asked in the post-test on the last day of class. Questions 8, 9 and 10 were most important in assessing higher ordered thinking (See Appendix A).

As shown above, question # 8 stated that efficiency is the most important consideration for determining if a policy is good or bad, and # 9 stated that the reverse, that equity is most important. We expected some students to prefer efficiency and others to prefer equity when they took the pre test . However, as teachers, we believed "false" was the "correct" answer to both because both efficiency and equity are important to policy analysis. Lectures and discussions during the course directly expressed the policy preferences of each of our disciplines. With this background, by the time students took the post-test they ideally would perceive that each discipline's perspective was limited, even narrow, because many variables bear on any policy.

Thus, an increase in "false" answers from the pre to the post test would serve as one indicator of increased higher order thinking.

The last question, #10, states "since markets benefit the strong over the weak, the government is the most effective way to give people the things they need at affordable prices." Lectures by the two of us illustrated that both the market and the government are institutions created by society to produce certain results. Neither is perfect, nor can it perform a function for which it is not designed: government can favor the strong over the weak just as much as markets can, and governments can be effective or ineffective. Ideally then, a "false" answer to this question would indicate the emphasis of both teachers had been understood.

IV. Analysis of Results from the Pre-test and the Post-test

Demographic findings in the pre- and post-test showed that among 23 students completing the course, 11 had taken some economics courses, 4 had taken some social work courses, 5 hadcourses in both disciplines, and 3 lacked exposure to either discipline.

Given the following responses to questions 8, 9, and 10 for both the pre-test (pre-8, pre-9 and pre-10) and the post-test (post-8, post-9, and post-10), no analysis of variance (or test of difference between two proportions) is necessary. Little difference existed between pre-test and the post-test responses:

Test question	True	False	Number
pre - 8 (efficiency is important)	9	18	27
post - 8	10	13	23
pre - 9 (equity is important)	7	20	27
post - 9	7	16	23
pre - 10 (market vs. government)	7	20	27
post - 10	10	13	23

This lack of variation in responses is disappointing in light of our course long efforts to illustrate that policy analysis is complex, and because we presented strong arguments for both efficiency and equity as important issues.

Further explanation about these findings is warranted. Between May when students registered for the course and September when it was offered, the course had been changed from upper-to lower-division and could no longer be included in an Economics major or minor program. Thus, after taking the pre-test and learning of this change, five people dropped the course; one person subsequently added the course. That explains the change from 27 responses to only 23 in the post-test. For reasons of convenience and to strengthen the case for the null hypothesis, the assumption is made that this net loss of four (correctly) answered false to all questions. Using this assumption to adjust the data, the conclusion of no variation in pre-test and post-test is amplified.

In the following table responses to questions 8 and 9, which respectively confer highest importance upon efficiency and equity for normatively analyzing public policy, show the number of students who chose one of the four pairs of possible responses: T/F (true for 8 and false for 9), F/T (false for 8 and true for 9), F/F (false for both 8 and 9), and T/T (true for both 8 and 9).

Test question responses	T/F	F/T	F/F	T/T	Number
pre-test	9	7	1	0	27
post-test	10	6	7	0	23

At the margin, only one or two students changed their opinions on the relative importance of efficiency and equity. Again, assuming the net loss of four students accounts for the drop from 11 to 7 in the F/F category, the above table suggests (at best) that one student from the pre-test F/T camp gained an appreciation for the role of efficiency in policy analysis and switched allegiance to the F/F camp at the post-test. But, that gain in higher-ordered thinking was offset by another student who lost confidence in equity as a policy analysis tool and switched from a F/F pre-test response to a T/F post-test response. (The likelihood that a F/T pre-test response was switched to a F/T response appears unlikely. However, the chance that one of the students who dropped after the pre-test had answered F/T and that the one student that added the course answered T/F in the post-test is highly likely).

Regardless of how the students adjusted their responses between the beginning and the end of the course, in both the pre-test and the post-test a majority of the students expressed a preference for efficiency or equity (sixteen in both the pre and the post test) and only a minority of the students recognized that neither one was the most important consideration (11 in the pre-test and 7 in the post-test). The only robust conclusion to reach from these responses is that our prior expectation that students, after recognizing the conflict between efficiency and equity as well as the importance of both in policy analysis, would change from either T/F or F/T on the pre-test and toward F/F on the post-test, was not fulfilled.

However, one indication that students developed an appreciation for the complexity of health and poverty issues is found in the responses to question 10, which stated "Since markets benefit the strong over the weak, the government is the most effective way to give people the things they need at affordable prices." Using the same order of responses to questions 8 and 9 used above (T/F, F/T, and F/F - no T/T answers were given), the students who then answered true or false to questions number 10 did change between the pre-test and the post-test. On the pre-test the responses to question 10, broken down according to the pattern of answer to questions 8 and 9, are:

Pre-test responses	T/F	F/T	F/F	Number
True for 10	2	2	3	7
False for 10	7	5	8	20
Total responses	9	7	11	27

And on the post-test the responses to question 10, broken down according to the pattern of answer to question 8 and 9, are:

Post-test responses	T/F	F/T	F/F	Number
True for 10	5	2	3	10
False for 10	5	4	4	13
Total responses	10	6	7	23

Again, assuming the net drops were from the F/F category, the F/T category stays relatively the same and the only major change from the pre-test to the post-test occurs among those who preferred efficiency over equity (the T/F group). Substantially more of them answered true to question 10 on the post-test than on the pre-test. During the course, these students decided that although efficiency is more important than equity in normatively analyzing policy, government provision of goods and services at affordable prices is either possible or desirable. Given that the two policy issues in the course were health care (wherein students analyzed the Canadian, English, and German health delivery systems against the Clinton proposal) and poverty (wherein poverty reduction was presented as an example of a public good, and federal provision of income maintenance was presented as preferred to local provision in order to avoid "dual-migration" or welfare magnets at the state or local level), it is not surprising that government provision gained in acceptance.

In conclusion, judging from the lack of variation between the pre-test and the post-test answers to questions 8, 9, and 10, very little objective evidence exists of an increase in higher ordered from beginning to end of the course. An analysis of responses to open-ended questions follows that gives some evidence of success in that same development.

V. Analysis of Open-Ended Course Evaluation Questions

A second means for evaluating higher ordered thinking was attempted with a different series of quantitative and qualitative questions that students answered anonymously on the final day of class. These questions intended to bring students' experiences back to the "Overall Learning Goals" as written into the original proposal for the team teaching course and outlined on the students' syllabus as follows:

1. To recognize that each academic discipline has its own perspective.
2. To understand why conflict exists in contemporary public discussion .
3. To think critically when selecting theories and model for explaining and improving the shared social existence.
4. To see themselves as citizens and future professionals effectively participating in analyzing urban issues.

Using responses from the final course evaluations (see Appendix B), students' perspectives are summarized here regarding three aspects of the team taught course: 1) Engagement in Higher Ordered Thinking as a Classroom Goal, 2) Objectives Accomplished in This Class Compared with Other Classes, and 3) Diversity of Perspectives as the Primary Benefit of the Course. Questions in the evaluation relate to the particular processes and materials used to develop higher ordered thinking skills in this economics classroom. In particular, these question address general educational processes in combining economics and social welfare concepts.

Question 1:
Engagement in Higher Ordered Thinking as a Classroom Goal

With simple YES/NO measures, students were asked to reflect back on whether the lectures, discussions and assignments asked them to engage in what was defined as higher ordered thinking. Then students were asked whether they themselves accepted this challenge and were personally engaged. This pair of questions also was written to test the variation in intellectual engagement among the various content areas which were: economic concepts, models of public policy making, health, and poverty.

YES dominated as the answer in all aspects of these questions. That is, students not only said they knew higher ordered thinking was being required of them, but they also assessed themselves as engaging in it. The majority, (21 of 23), of respondents felt this was most true regarding their involvement with economic concepts, and least true (18 of 23) regarding health policy - on which they had spent the least time and likely least anticipated as content when registering for the course.

Question 2:
Objectives Accomplished in this Class Compared with Other Classes

A second set of questions used a four point Likert scale to compare the challenge and accomplishments in this team taught course with those from the regular classes the students have had before. The nine objectives below served as the base from which to make this comparison. Each objective was preceded by the phrase "This [team taught] class, more than other classes I have taken":

1. presented more than one set of theories of perspectives
2. required integration and synthesis of different theories and perspective
3. required recognition of more than one side of an issue
4. helped recognition of the perspective of one who proposes policy
5. challenged preconceived notions about disciplines
6. prepared for work or career
7. included perspectives from different cultures
8. increased your participation as a citizen
9. required integration and comparison of ideas in written assignments.

For each of these objective, students selected a score from one to four, with one meaning that this class offered little compared to others, and four suggesting that it offered more. The mean for the entire set of objectives was 2.9. However, the following objectives stood out with higher means of 3.4:

1. presented more than one set of theories of perspectives
2. required integration and synthesis of different theories and perspective
3. required recognition of more than one side of an issue.

These simple quantitative means show that for the students enrolled, this class stood out among other courses in its emphasis on presentation of diverse perspectives and their use in intellectual reasoning. The concept of diversity in views was explored with further questions requiring qualitative responses.

Question 3:
Diverse Perspectives as the Primary Benefit of the Course

When asked for a qualitative description of the course's "benefits," 13 of 21 comments related to the presence of and presentation of "diverse perspectives" in the classroom. For example, written responses describing course benefits included:

-- Great class discussions and thinking taking place on issues that make people question their own views.

-- When you (the professors) debate with each other we really got to see different perspectives.

-- Variety of perspectives.

-- A different point of view is always better to help understand a concept.

-- Really forced me to consider different schools of thought/outlooks on the same issues.

-- A range of ideas on the same topic.

-- More than one perspective was given. Wholistic view of the issue.

-- Learned three different points of view on the same subject.

Only a handful of students wrote of the inderdependency of diverse knowledge and theories, which indicated a more complex understanding of course content than those who simply observed the existence of parallel or opposing ideas.

Aside from their enthusiasm for recognizing disciplinary differences, 13 of 21 students said they came with personal views already formed as to the different approaches of professionals in economics and social work. These students said that for them nothing presented in the course had changed these views from the beginning of the quarter to its end. That is, for over half of the class, this course reinforced pre-existing views. (Note, too, the quantitative evaluation from the pre and post-test which suggested that many did not change their pre-existing views). Unfortunately, students were not articulate in stating what their pre-existing views had been except for a few comments that reflected narrow stereotypes:

-- "I still have a hard time understanding anything about economics. Nothing about it has excited me to learn more."

-- "I still feel that social workers are communist pigs. I feel this way because they try to have too much government intervention."

When asked to elaborate on the contradictions or differences in how professionals in economics and social work analyze public policy, students used a variety of frameworks. A few applied the vocabulary of economics, saying for example that, "Social issues are inefficient, economically speaking, [they take] a lot of time". More students suggested political positions as inherent in the differences. For example, "I see contradictions between what is socially 'correct' and what is economically viable," and "public health and social work are more concerned with individuals. Economics is more concerned with broader actions of the majority." A few students weighed differences in relationship to personal comfort or discomfort, saying, for example, "Econ is a lot more stuffy!"

When asked to elaborate on ways in which policy analysis in economics and social work is complementary or similar, comments were equally split in number between those focusing on the goals of the disciplines, and those noting similarity in processes. Example of statements focusing on the goals of the discipline are:

-- Both look for the policy to work efficiently to a desired outcome

-- It seems that in the end we are all trying to benefit society
-- They are all looking to help people and be efficient
-- They both look at the path it took to achieve the outcome, and those noting similarity in processes are:
-- All are interested in choices made in policies.
-- They both look at the path it took to achieve the outcome.
-- They deal with the same issues when it comes to urban problems.
-- They all look at supply and demand
-- All are concerned with the effect distributing resources has on society as a whole.

VI. Conclusion

Student evaluations support the conclusion that the structure and content of this team taught course was very successful in providing an environment where students believed they were participants in higher ordered thinking. More specifically, students saw and valued the presence of multiple and sometimes conflicting theories and models which went beyond that presented in most of their university classes. The first two Overall Learning Goals appear to have been accomplished, these were to recognize that each academic discipline has its own perspective, and to understand why conflict exists in contemporary public discussion. However, much less evidence exists regarding accomplishment of Goals three and four which were to think critically when selecting theories and models for explaining and improving the shared social existence and to see themselves as citizens and future professionals effectively participating in analyzing urban issues.

Benjamin Bloom's taxonomy[6] of cognitive development offers language with which to further evaluate learning in this particular classroom. Students went beyond recalling concepts (stage 1 - Knowledge); they could remember and apply abstractions (stage 3 - Application) and they could see relationships between ideas (stage 4 - Analysis). This was inherent in students' comments about recognizing diversity in the views presented and in students' ability to describe contradictions as well as similarities in ideas. Less learning was apparent in relationship to stages 5 and 6 which require associating elements into a whole and judging the value of ideas for specific purposes, tasks inherent in higher order thinking. For example, students' commentssuggested that they could identify ideas in conflict, but they did not think further to design ways to integrate or resolve differences.

Students' recognition and appreciation of the juxtaposition of economics and social welfare principles cannot be understood as synonymous with their recognition of the conflict between equity and efficiency as policy making standards. Nor is it clear that the majority of students -- who did value diversity in views -- experienced changes in the views to which they were predisposed prior to the course. For example, 13 of 21 students said their views remained unchanged as to differences between economics and social work as disciplines.

Diversity in the view points of assigned readings and in the ongoing, obvious intellectual conflict between faculty in the classroom apparently left an impact on students. They saw clearly that divergent theoretical perspectives exist and result in different policy approaches to the same problem. This activity in the classroom interrupts students' inclination to sit and wait for "the answer" to be given them. For that reason alone, such designed controversy is valuable for teaching. However, students' ability to exercise higher order thinking and to make their own judgments regarding when and how to use equity versus efficiency was not as evident.

VII. Classroom Activities to Further Support Higher Order Thinking

Questions in essay exams required students to analyze and argue two sides of hypothetical policy issues. A group assignment to monitor and report on an actual community development problem also required them to consider equity versus efficiency; they judged this assignment to be the most useful one they carried out. However, additional assignments and classroom exercises might have further encouraged an internalization of the diverse concepts about which students heard and read. That is, further activities might have presented diverse views in ways that were less "benign" and that involved students in thinking that "troubled" them more.

For example, exercises might have asked students to reflect on decisions in their own personal experiences where equity and efficiency were in contest. Such drawing out of students' experiences and framing them within the vocabulary of the discipline is characteristic of approaches long used in the social work classroom and now commonly encouraged in texts on classroom assessment techniques.[7]

Beyond being witness to the diverse perspectives and contrary ideas presented by faculty, students could have been assigned positions to develop and represent in mock debates on urban policy. Particularly if students are asked to role-play by arguing in one policy case the efficiency side and in another to argue the equity side, they may further understand and appreciate the principle for which they do not have a preconceived preference.

Notes

[1] Bloom, Hastings, and Madaus, 1971, pp. 271-273.

[2] Angelo, 1991, pp. 18-19.

[3] Heffernan, 1992, pp. 488-62. See also Berkowitz and McQuaid, 1992, pp. 9-14.

[4] Stice, 1987.

[5] Angelo and Cross, 1993.

[6] Ibid.

[7] Bloom, et. al, op. cit.

References

Angelo, Thomas A., editor. Classroom Research: Early Lessons from Success. San Francisco: Jossey-Bass Publishers, 1991.

Angelo, Thomas A and K. Patricia Cross. Classroom Assessment Techniques, A Handbook for College Teachers, 2nd edition. San Francisco: Jossey-Bass Publishers, 1993.

Apple, Michael. Ideology and Curriculum. Boston: Routledge and Kegan Paul,1979.

Berkowitz, Edward D. and Kim McKaid. Creating the Welfare State, The Political Economy of 20th Century Reform. Rev. ed. Lawrence: University of Kansas, 1992.

Bloom, B.S., Hastings, J. T., and Madaus, G. F. Handbook on Formative and Summative Evaluation of Student Learning. New York: McGraw-Hill,1971.

Bloom, B. S., and others. Taxonomy in Educational Objectives. Vol. 1 Cognitive Domain. New York: McKay, 1956.

Heffernan, W. Joseph. Social Welfare Policy. New York: Longman, 1992.

Stice, J. E. editor. Developing Critical Thinking and Problem Solving Abilities. San Francisco: Jossey-Bass, 1987.

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APPENDIX A

PRE-TEST /POST-TEST ECON 365
September /November 1993

SURVEY OF STUDENTS' ATTITUDES AND KNOWLEDGE BASE IN ECONOMICS, SOCIAL WELFARE & POLICY

What is your major ?________. How many credits have you earned in it? ____

Have you taken other classes in economics? ____ in social work ?____
please list them ____

Please answer the following with a few sentences, use the backside if necessary.

1). What do you think professional economists and social welfare professionals have in common?

2) How do the two differ?

3). In what ways can economic theory contribute to the study of urban issues?

4) In what ways can a social work/welfare perspective contribute to the study of urban issues?

Answer the following by writing T for True or F for False in the blank.

5). ____ Studying theories is more appropriate for graduate than for under graduate education.

6). ____ The most important factor in creating policies affecting health care is affordability.

7). ____ With creative leadership cities can effectively improve the employment opportunities in their area.

8). ____ Efficiency is the most important consideration for determining if a policy is good or bad.

9). ____ Equity is the most important consideration for determining if a policy is good or bad.

10). ____ Since markets benefit the strong over the weak, the government is the most effective way to give people the things they need at affordable prices.

APPENDIX B

ECON 265 URBAN ECONOMIC POLICY Fall Qtr 1993

Course Evaluation

This class was designed to offer content and experiences to strengthen your Higher Order Thinking Skills (HOTS) and Critical Thinking Skills so that you can identify, integrate, and implement theoretical concepts in your understanding of urban issues. You are the only one who can indicate the degree to which this goal was achieved.

Answer the questions below as directed, being aware that responses will be read by the instructors of this course for the purpose of evaluating how well we fulfilled our teaching objectives. Honest answers are preferred over ones that will make us feel good (but the latter will be appreciated).

1. Lecture, discussion, and assignments asked students to engage in HOTS and Critical Thinking during each of the four listed content areas:

a. Economic Concepts	YES	NO
b. Public Policy Models	YES	NO
c. Health as Public Issue	YES	NO
d. Low income Employment as Public Issue	YES	NO

2. Lecture, discussion, and assignments engaged you personally in HOTS and Critical Thinking during each of the four listed content areas:

a. Economic Concepts	YES	NO
b. Public Policy Models	YES	NO
c. Health as Public Issue	YES	NO
d. Low income Employment as Public Issue	YES	NO

3. The class assignments were intended to offer content and experiences to strengthen your Readiness for Work and Career beyond school. Please evaluate how "useful" you feel the assignments will be to your future work by circling the number that applies to you.

	Not Useful	Somewhat Useful	Useful	Very Useful
a. Reading assignments	1	2	3	4
b. Print Media portfolio	1	2	3	4
c. Public Issue Project/Paper	1	2	3	4

4. Compare this class to others you have taken by putting a number from 1 to 4 (1 being least positive and 4 being most positive) to assess how well certain objectives were accomplished. These objectives include that this class, more than other classes you have taken:

_____ a) presented more than one set of theories or perspectives on a single problem

_____ b) required you to integrate and synthesize different theories or perspectives

_____ c) prepared you for your work or career
_____ d) increased your participation as a citizen in a democracy
_____ e) included perspectives and deal with problems from cultures different from your own
_____ f) surprised you in terms of your preconceived notions or stereotypes of the disciplines of the teachers
_____ g) required you to recognize more than one side of an issue
_____ h) helped you to recognize the perspective of the presenter or supporter of a proposed policy
_____ I) required integration of and comparison of ideas not only during in-class discussion but also in written assignments

5. Compared to your expectations at the beginning of the course, has there been any change in your stereotype of the social work, economic, or public health disciplines? YES NO
EXPLAIN:

6. In terms of the way in which these disciplines analyze policy proposals, what complementarity or similarity exists between the disciplines.

7. In terms of the way in which these disciplines analyze policy proposals, what contradictions or differences exists across the disciplines.

8. This class was a a three part experiment in Team Teaching to provide students -- and faculty -- with broader exposure than what certain courses regularly offer. Please describe your own experience regarding this team teaching by listing the benefits and/or deficits you experienced owing to this approach in this class. (We realize that you aren't able to compare what this particular class would be like without the Team Teaching.)

A. Your perspective on benefits you experienced by the Team Teaching approach:
   a.
   b.

B. Your perspective on the deficits (costs) you experienced by the Team Teaching approach:
   a.
   b.

9. Knowing ahead of time that a class was to be team taught, would you enroll in it?
YES NO

10. Knowing ahead of time that these three faculty were teaching it, would you enroll in it?
YES NO

Designing Multiple Choice Tests

Rick Hansen
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Multiple-Choice Tests

Advantages

They allow broad coverage of both content and the level of student comprehension.
They are as successful at evaluating higher orders of understanding as are essay questions.
Scoring a multiple-choice test:
  is easy, accurate, and statistically reliable.
  eliminates some sources of potential scoring bias.
  provides the opportunity to analyze each question for:
    its difficulty.
    the frequency of incorrect responses to the question.
    its power to distinguish between high- and low-scoring students.

Disadvantages

They do not reveal the thought processes used by the students to select their answers.
Constructing good multiple-choice questions can be time consuming.
They might favor "test wise" students (field independent thinkers) who are able to find inadvertent clues in poorly written questions.
Taking them might be more difficult for learning disabled students.
Writing and oral communication skills are not measured.
Successful guessing counts the same as knowledge.

Teminology

Multiple-Choice Item: a test question for which a number of response choices are given and from which a correct response is to be selected

Stem: the initial part of an item identifying the task to be completed

Options: all of the response choices for an item

Key: the correct option

Distractors: the incorrect options

Suggestions For Constructing Multiple Choice Exams

Choose Concepts to be Tested

Use pre-determined learning objectives as the foundation for testing.
Avoid testing trivial or esoteric concepts.

Items

An item should focus on one central idea clearly presented in the stem.
Use language that is simple, direct, and unambiguous in order to avoid confusion or alternative interpretations.
Options ought to flow smoothly from the stem and should relate to it in the same way.
A knowledgeable student should usually be able to complete the task required by the item without knowing the options.
Items can employ the following formats.
- Correct answer - only one option is correct.
- Best answer - one option is clearly superior to the others.
- Negative response - only one option is not correct.

Items with two options are superior to true-false questions in that they require recognition of the truth or falsity of **two** statements.
Avoid using double negatives in an item. If the stem calls for the identification of an option that is not true, or correct, then **both**:
- phrase the options in a positive fashion.
- emphasize the negative in the stem via capitalizing or underlining.

If several items are based on a common stimulus such as a graph or table of data, ensure that each item is independent of the others. Do not make answering one question correctly contingent upon having correctly answered a previous one.

Item Arrangement

Items can be arranged randomly, by concept, by sequence taught, or by item difficulty from easiest to hardest.
Research suggests that, while item arrangement is not critical, placing easier items at the beginning of a test instills confidence in test anxious students, enabling them to do better on subsequent items.

Stems

The stem can consist of a question, a problem, or an incomplete statement that is concluded by the options.
- If the stem consists of an incomplete statement, the incomplete segment (i.e., the blank) should be at the **end** of the statement.
- A stem can be a question requiring a "yes" or "no" response that is coupled with an explanation.

The stem should contain as much of the question as possible so that the same words are not repeated in each of the options.

Options

- Make certain that the key is correct and that the distractors are not. (Distractors, however, should be **plausible** to the uninformed student.)
- The number of options used is less important than their quality.
  - Research shows that offering three options rather than four or five:
    - does *not* influence the reliability of a test.
    - does affect a test's measurement students' abilities, *increasing* it for more-able students and *decreasing* it for less-able ones.
  - Decreasing the number of options reduces reading time, which allows more items to be included on a test given in a fixed time period.
- Avoid both using "all of the above" or "none of the above" as options and "always" or "never" in the options.
- Generally, avoid using "complex options" (in which an option indicates that more than one of the other options is correct).
- Avoid *inadvertent clues* ("specific determiners").
  - Options should utilize similar terminology.
  - Options should be of roughly the same length.
  - Options should be grammatically consistent with the stem.
  - An item should **not** provide clues to another item.
  - If possible, arrange the options in a logical sequence, for example, by option length (shortest to longest or vice versa), numerically, chronologically, or alphabetically (with single word options).
- The key should be placed in each option position approximately an equal number of times. Research reveals that test scores vary **positively** with the frequency of the correct answers being the **first** option.

Distractors

- One method of devising good distractors entails asking the students True/False questions and having them give the reason for their answers. This allows **both** the discovery of student misunderstanding (which can be corrected in class) and the identification of plausible distractors.
- The following are also potential sources of good distractors.
  - Common misconceptions, stereotypes, or problem-solving errors.
  - True statements related to, but that do not answer, the question.
  - Statements that are too broad or narrow to answer the question.
  - One pair of opposite statements that does not address the question when used with another pair of opposites, one of which is correct.

Additional Considerations

Test Goals and Outcomes

Criterion referenced tests are intended to determine how well students have learned the desired material (i.e., students are measured against the objectives of the course).
Norm referenced tests are designed to distinguish between or rank students (i.e., students are measured against one another).
Educators maintain that students should be expected to perform better on criterion than on normed referenced tests.

Test Various Levels of Understanding

Different levels of understanding can be tested with multiple-choice questions (e.g., recognition, application, analysis, and synthesis).
Bloom's taxonomy is often used to identify comprehension levels; empirical research, however, neither verifies nor refutes the superiority of this classification scheme nor does it suggest what proportion of a test's items should examine each level of cognition.

Student Preparation

A unit's objectives, and hence those of the test, should be shared with the students. This can be accomplished, for example, by distributing: a list of learning objectives; a test log indicating what concepts will covered on the exam; a review sheet highlighting the principal ideas treated in the unit; or, sample test questions.
A "practice" test can also be given to prepare students for an exam. Such a test could be: administered in class or on a take-home basis; worked on by students individually or in small groups; a non-graded assignment or one that is given less weight than that of an exam; scored and simply returned to the students or discussed in class.

Test Administration

Research reveals that there is **no** relationship between the time given for a test and test scores if ample time is allowed. Educators advise giving enough time for at least 90% of the students to finish an exam.
Students should be told before the exam *or* via test instructions:

the format of the test (e.g., there are 20 multiple choice and two free-response questions).
the scoring system that will be used (e.g., 2 points per question).
how they are to signify their responses (e.g., mark your answer in the appropriate place on the answer sheet, circle your answer).
any restrictions that apply (e.g., use only a No. 2 pencil to mark answers, do not write on the test, calculations must be shown)
how to treat doubts about an item (e.g., request clarification, describe the nature of your uncertainty and explain your answer).

Returning Scored Tests

Research suggests that students benefit more from covering tests when two or three days have elapsed since the test was taken (rather than immediately after the test). Also, an alternative to the instructor's "going over" the test involves forming teams in which the students work together to determine why they chose incorrect responses.

Test Scoring and Item Analysis

Scoring Methods

Award points only for correct answers (the most popular method).

Penalize for guessing by subtracting a fraction such as 1/4 of the number of wrong answers from the number right Research suggests, however, that this *increases* the number of **both** wrong and omitted items (probably because it discourages students from answering an item if they are uncertain, so that they omit items for which they have a greater than random chance of selecting the correct answer).

Allow students to choose more than one option and, if one of them is correct, let the item score be an inverse function of the number of responses chosen. There is conflicting empirical evidence, however, about whether this improves the reliability of a test.

Give partial credit for answers that are not "best" but are in some way superior to other distractors. While research indicates that this is more reliable than the "number correct" scoring system, it does require very careful option design and pre-planned ranking of the options by degree of acceptability.

Item Analysis

Item analysis considers several statistics computed for each item.

Difficulty Coefficient

This figure is the percentage of students who answered the question correctly.

If less than 25% of the students correctly answered an item, this could signify a fault with the item (or the instruction).

Discrimination Coefficient

This statistic indicates how well an item differentiated the students who did well on the test as a whole from those who did poorly. It can be computed as the difference between the proportion of students scoring in the top 27% on the test and the proportion of those scoring in the bottom 27% who answered the item correctly. (Also, it can be calculated as the simple item-test correlation coefficient, which is approximated by the method described above.)

Educators maintain that discrimination coefficients will fall ideally within a 0.30 to 0.60 range.

A negative or low (less than 0.20) discrimination coefficient might mean there is a problem with the item (or the teaching).

An example of item analysis can be found in Appendix 1.

Percentage of students choosing specific distractors

If only a few students select a distractor, it could be either revised or omitted from future tests.

If a large percentage (say, more than 50%) of students choose one distractor, it might denote a difficulty either with the distractor or with students' comprehension of the material.

Making Test Design and Construction Easier

Modify existing test bank questions to make them fit the specifics of your course, to improve them, or both.

Write a parallel question for future use after constructing an item.

Use item analysis to improve questions, and keep records of the item analysis of previously used questions.

Use student input from "cooperative learning teams" that are allowed to contribute test items.

APPENDIX I

SAMPLE ITEM ANALYSIS

Percent Correct

Item	Whole Class	Top 27%	Bottom 27%	DC*
1	95	99	62	0.37
2	68	89	53	0.36
3	81	85	64	0.21
4	95	98	92	0.06
5	60	85	35	0.50
6	75	96	61	0.35
7	75	98	67	0.31
8	95	91	98	-0.07
9	85	93	50	0.43
10	45	65	25	0.40
Mean	77			0.28

* The Discrimination Coefficient (DC) is the difference between the proportion of the top-scoring students and that of the bottom-scoring students who answered the item correctly. The discrimination coefficient for three of the sample items, each of which was answered correctly by 95% of the students, are noteworthy. The DC for Item #1 signifies that the question differentiated well between the high-scoring, and the low-scoring students, even though the class as a whole scored high on the question. Item #4's DC reveals, by contrast, that the question did a poor job of distinguishing the students who did the best on the exam from those who did the worst. And, the DC for Item #8 has a negative value, which indicates that the students who did the poorest on the test as a whole did better on that item than those students who did the best on the exam!

Selected Bibliography

Aiken, Lewis R., "Testing with Multiple-Choice Items," Journal of Research and Development in Education, 20(4), 1987, 45-58.

Ben-Shakhar, Gershon and Sinai, Yakov, "Gender Differences in Multiple-Choice Tests: The Role of Differential Guessing Tendencies," Journal of Educational Measurement, 28(l), 1991, 23-35.

> Correction for guessing lowers males' scores relative to females' scores on multiple-choice tests, but different guessing behavior accounts for only a small fraction of observed gender differences on such tests.

Bennett, Randy E., Rock, Donald A., and Wang, Minhwei, "Equivalence of Free-Response and Multiple Choice Items," Journal of Educational Measurement, 28(l), 1991, 77-92.

> Little evidence that free-response and multiple-choice test formats measure different constructs was found.

Bresnock, Anne E., Graves, Philip E., and White, Nancy, "Multiple-Choice Testing: Question and Response Position," Journal of Economic Education, Summer, 1989, 239-245.

Bridgeman, Brent and Rock, Donald A., "Relationships Among Multiple-Choice and Open-Ended Analytical Questions," Journal of Educational Measurement, 30(4), 1993, 313-329.

> No new dimension of learning appeared to be tapped by open-ended questions on a new version of the Graduate Record Exam.

Cantor, Jeffrey A., "Developing Multiple-Choice Test Items," Trainin-g and Development Journal, May, 1987, 85-88

Divgi, DR., "Does the Rasch Model Really Work for Multiple Choice Items? Not if You Look Closely," Journal of Educational Measurement, Winter, 1986, 283-298.

Eisen, James, "Assessment Begins in the Classroom," Unpublished Mimeograph, Center for Teaching and Learning, Southeast Missouri State University

Feldt, Leonard S., "The Relationship Between the Distribution of Item Difficulties and Test Reliability," Applied measurement in Education, 6(l), 1993, 37-48.

Frary, Robert B., "Multiple-Choice versus Free-Response: A Simulation Study," Journal of Educational Measurement, 22(l), 1985, 21-3 1.

> Based on simulations, free-response tests were found to be slightly superior, but their advantage was outweighed by other advantages of different format choices.

Haladyna, Thomas M., "The Effectiveness of Several Multiple Choice Formats," Applied Measurement in Education, 5(l), 1992, 73-88.

Hancock, Gregory R., Thiede, Keith W., and Sax, Gilbert, "Reliability of Comparably Written Two-Option Multiple-Choice and True-False Items," Educational and Psychological Measurement, Autumn, 1993, 651-660.

Journal of Economic Education, 1989 special edition devoted to "The Test Item"

Thissen, David, Steinberg, Lynn, and Fitzpatrick, Anne R., "Multiple Choice Models: The Distractors are Also Part of the Item," Journal of Educational Measurement, 26(2), 1989, 161-176.

Item response analysis is exhaustively and graphically examined.

Wainer, Howard and Thissen, David, "Combining Multiple Choice and Constructed Response Test Scores: Toward a Marxist Theory of Test Construction," Applied Measurement in Education, 6(2), 1983, 103-118.

No evidence was found that these two components of the Advanced Placement chemistry and computer science examinations measured different constructs.

Walstad, William B., "Multiple Choice Tests for Principles of Economics Courses," in The Principles of Economics Course, edited by Phillip Saunders and William B. Walstad, New York: McGraw-Hill, 1990.

Walstad, William B. and Becker, William E., "Achievement Differences on Multiple Choice and Essay Test in Economics," Unpublished Paper Presented at American Economic Association Meetings, January, 1994.

Little to no difference was detected between the two types of tests in terms of what they measure on the Advanced Placement examinations in micro and macro principles of economics.

Teaching Economics Via Satellite

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Introduction

Several years ago, Western Michigan University embarked on a program to offer courses to off-campus students via satellite. Last year, I had the opportunity to teach such a course to MBA students that needed to fulfill an Economics course requirement. The course, a micro-macro survey course, was taught to students in four remote sites and a "live studio audience". The lectures were delivered live via satellite in an interactive mode (two-way audio, one-way video).

This is a mode of instruction that is not yet fully tapped by most colleges, but budgetary constraints are forcing many institutions to think about innovative ways of providing quality instruction while cutting costs. Telecourses expand the potential markets of higher learning geographically and demographically. Students can take advantage of live interactive lectures at a location close to home or their place of work without having to worry about commuting time or the availability of educational opportunities in their region. This is a perfect medium for the nontraditional student to participate in higher learning with minimum conflict with the demands of his or her job.

Universities have handled televised courses with varying degrees of sophistication. Some have simply brought in a camera to a traditional classroom and taped lectures to be broadcast at a later date, while others have equipped an electronic classroom with the latest technology to deliver a live interactive course via satellite.

In this paper, I intend to go over the steps involved in the preparation and delivery of a telecourse. It is important to stress that a telecourse is not a traditional course with a camera in the back of the room, courses developed in this fashion are doomed to fail. Techniques used in a traditional classroom do not come across in the same way on a TV screen. A scratch of the nose, a crooked smile, a frown, a squint, or a licking of the lips are subconscious actions that are magnified and look awkward on a monitor. Material presented on a chalkboard or overhead projector will not show as clearly on TV, and watching a blank screen while the instructor is erasing the chalkboard is not a good way of retaining the viewers' attention. I would like to focus on the following areas:

1. The technical requirements
2. Advance preparation
3. Delivering the lecture

1. The Technical Requirements:

The lecture should be delivered in an electronic classroom or a studio that allows for students taking the course on campus to serve as audience. The room should have three cameras strategically placed and operated via remote control, a podium that has all the necessary controls and a telewriter and built-in monitors, as well as additional monitors strategically placed around the room. Proper lighting and sound-activated microphones are needed. The instructor should be equipped with a wireless microphone and an earpiece to listen to instructions from the producer in the control booth. The control room requires a staff of three technicians: a producer who is overseeing the whole process and maintaining contact with the instructor, an assistant producer who operates the equipment under the direction of the producer, and a third individual is needed in order to maintain contact with the remote sites. Each of the remote sites should be staffed with a coordinator who handles communications and administering exams. Finally, there should be the capability to uplink to a satellite and downlink from the satellite at the remote sites.

2. Advance Preparation:

Preparing for a telecourse is quite different from preparing for a traditional course. Satellite time is very expensive and inflexible. You cannot extend the lecture beyond your allotted time because the satellite connection will be cut off on time and you cannot finish a few minutes early because you will end up with very expensive and awkward dead air. Planning the lecture has to be much more structured than the traditional flexible way in which we normally plan our lectures. All graphics, tables and visual aids have to be prepared in advance and provided to the technical staff. It is imperative that the whole course be planned long before the first lecture is to be delivered. Coordinating the lectures with the technical staff requires hours of preparation and rehearsal.

3. Delivering the Lecture:

Advance preparations and rehearsals allow you to be familiar and confident in the use of the array of equipment available to you during the lecture. Having students in the audience is extremely important in allowing you to act as naturally as possible because you are used to lecturing to faces looking at you. It is also important to keep eye contact with the cameras so you can make your remote audience feel included. When the instructor asks a question requiring response from the students, it is necessary to wait for a period of twenty seconds before moving on. The time is needed to allow students in the remote sites to respond by dialing the studio. The instructor needs to make an extra effort to engage the students in the remote sites. This can be done either by addressing a question to a particular site, or addressing students by name.

During the presentation, I showed a videotape that described the electronic classroom and it showed some samples of lectures that illustrated the use of graphics and the interaction with the students in the studio as well as students in the remote sites. I also showed samples of graphics used in the course as well as samples of a coursebook that I developed specifically for the televised course.

Conclusion:

Distance education is an area being looked at very seriously by more and more colleges. Teaching economics via satellite is one method to provide distance education conveniently while maintaining some interaction between the instructor and the students. In future work, I will be concentrating on the use of computers in developing economics courses that take advantage of multimedia. This would be another tool that will help make course delivery more efficient and flexible. The technological advances that are currently under way can only make the "electronic" classroom more affordable and easier to use, thus increasing its availability to colleges of any size.

Action Research Groups as a Student Learning Tool

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The use of applied action research can be a practical teaching technique in many economics courses. Its use provides a link between the theory and information that students often find barren and the realities with which they are familiar. Such learning activity more closely relates to what students will do in their professional lives. Lectures are given most of the attention in the developing of a course, perhaps because they are more effective in presenting theory and information, as well as easier to define and plan. Yet, group learning, built around action research, actively engages students, and can be a powerful method for the delivery of learning.

Applied Research

Academic research serves an array of purposes. As scholars, we can divide it into two general types: (1) the basic research done to add to and advance the common knowledge and (2) applied research. Applied research differs from basic research in that it seeks findings that can be used directly in practical decision-making, and to bring about improvements in practices, policies, and procedures. Applied research brings a human and absorbing element to research. Such research is often mission from undergraduate courses; yet it is those qualities make learning more compelling for students (Bogdan and Biklen, 1982).

Action Research

Action research is a form of applied research. "Action research is the systematic collection of information that is designed to bring about social change .... applied research in which the researcher is actively involved in the cause for which the research is conducted (Bogdan and Biklen, 1 982)." The process of action research involves the organized gathering, assembling and reporting of data, evidence, reasoning, solutions and persuasive argument with which to uncover inefficiency, injustice or peril and advance actions for change. It uses both quantitative and qualitative research for social problem-solving.

"The approach would seem to be a natural for those who purport to value student participation in the learning process (Training,1990)." Action research can have a captivating appeal for students because it bridges the gap between sterile theory and day-to-day reality. The accepted importance of this theoretical-practical linkage can be seen in the ever-expanding use of case studies, historical examples, and news stories in economics texts. However, nothing appeals to learners more than hands-on activity. What could be more compelling than a problem solving research project that the students have defined from their own interest in and interpretation of the theory and issues they are studying?

An appeal of action research is that students can become familiar with the work of professional investigators in the news and political reform arenas. This work is not as quantitative or theoretical as what many economists would call research. It is different from the more rigid basic research done to add to and advance economic doctrine. Yet, such research is customary in business and education. It has many of the features of academic research and is more closely related to what students will do in their professional and community life. "Action research is the familiar process that forms the backbone of all sorts of practical, real-world change efforts (Training, 1990)." Students find action research rewarding and informative.

Action research is often the tool of practitioners studying their own practices. It can be a self-reflective inquiry undertaken to improve the understanding of what is being done and what can be accomplished. Action research has become popular as a tool for systems planning and policy development. It brings research and decision making together. Social psychologist Kurt Lewin, who coined the phrase "action research", viewed this type of activist research as being essential to gaining a serious understanding of "the laws of social life." Conceptual problems, theoretical analysis, and descriptive fact-finding, along with laboratory and field experiments, would have to become part of basic social research (Kemmis, 1985). The tie-in between activist research and "the laws of social life" as a means of developing astute understanding , beckons to the economics classroom. Every instructor hopes students will become practitioners of economic understanding.

Action research is not defined by any particular set of research procedures used. However, the techniques of generating and accumulating evidence about issues and practices and the techniques used to analyze and evaluate the data collected is more that of interpretive or qualitative researchers, such as ethnographers, case study researchers, and business decision-makers. What distinguishes action research, however, is not the less empirical technique, but rather, the cycles of diagnosis, data gathering, reflection, action planning, acting, and reflecting (Kemmis, 1985). The techniques of action research provide a workable, attainable tool with which to enhance student learning in economics.

In order to serve the academic purpose properly, action research must maintain the significant attributes of academic research "...among them a concern with extending theory, a focus on causal explanation of social phenomena, and intimate connection between the work at hand and preexisting research and theory. (Lindblom and Cohen, 1979)."

Small Group Learning

A distinguishing attribute of action research is its cooperative learning character. It is defined in part by collaboration between participant and researcher. Such research often involves professional practitioners researching their own issues in an arrangement of common study, diagnosis, and action (Training, 1990).

In teaching and learning there are two main ingredients: (1) the message and (2) the process or media used to deliver that message. The process is the dynamics of what is happening among the participants. Perhaps, because it is easier to define and examine, we commonly give the message most of the attention when developing a course. Process rarely gets the same amount of attention; yet, it is often what makes a course a success. A compelling process is often what it takes to get students to work effectively. Small group learning, a strategy that actively engages students, can be a powerful method for the delivery of learning. Social interaction is a vital part of all effective learning. It has been found that groups learn better than individuals. The presence of others during a learning experience increases motivation; group judgment is more reliable; and groups usually find more and better problem solutions. In an academic setting, group discussion offers students the chance to organize their thoughts by comparing ideas and understanding with others. Working within a group allows students to test themselves by giving expression and form to their knowledge. Group discussion can give students a chance to monitor and take control of their own learning and gain self-direction and confidence. While not more effective than reading or lectures in presenting basic theory and information, groups better facilitate cognitive learning. Learning to think is most important in a student's academic growth. In a well functioning group students are able to tap into a cooperative ambience of stimulation and assistance. Research shows increased academic achievement with cooperative learning. The combination of group goals and individual accountability are seen as contributing to that achievement. The understanding that an individual's contribution is needed to achieve the group goal is a strong motivator. Significant gains in student mastery as a result of cooperative learning has been seen in studies of college-level classes in an array of subjects. Groups are significantly better for teaching thinking skills (Allender, 1982; Hike,1990; Jacques,1985). Teaching thinking skills is what economics education is all about.

As economics educators, we should recognize the increasing need for graduates to use planning, research, and communication skills when serving on committees and working with clients and colleagues. Teamwork and cooperation have become an essential feature of the workplace. There are greater expectations for graduates to communicate well and to be skilled in listening, drawing out information, and persuading, all of which are strengthened through action research group work (Jacques, 1985).

Structuring Group Learning

Giving students a group assignment is not an easy alternative to lecturing. If action research works as a student learning tool, economics will be more interesting, more rewarding, and more fun for both instructor and students. However, it will not be less work. For group learning to be successful, the instructor must carefully plan, monitor, and evaluate the group process. Prior to forming the research groups and giving the assignment, the general nature of the task must be spelled out and the teaching of the research method and objectives planned. Students must be given a clear explanation of their task and explicit directions for the process to be followed. At the start of the process, as well as while it evolves, the instructor will need to define key terminology and theory and relate them to previous learning (Hike, 1990).

Even with upper level students, simply placing students in groups does not ensure cooperative learning. Even if group formation has been carefully planned, students may have to be coached in the skills and manner crucial for effective group performance. As the group works together, listening carefully, critically thinking, offering assistance, and taking turns will all be vital to success. The instructor must make sure such practices are built into the action research group process. Obstacles can arise with any learning group. To insure that the process is working, the instructor must watch for and correct any problems. Some students are reluctant to participate, while others dominate the discussion and decision-making. Some students try to do all the work on their own. One student may see the group as a way to promote a given agenda or philosophy. If needed, such obstacles can be overcome by assigning roles and evaluating the group by how well the assigned roles are performed (Hike, 1 990). With college students, especially in advanced classes, problems should dissolve as the process evolves.

Implementation

Instructors, as well as students, must assume new roles in order to successfully implement this strategy in the classroom. Terms and concepts must be clearly spelled out. The instructor must insure that applicable theory and a focus on causal explanation is understood and used. They may have to teach the social skills of effective group work and will surely have to teach effective topic development along with research planning and execution. For action research, the added skills of compelling persuasion, negotiation, and understanding political reality are extremely important. These are skills that those who teach and promote economic reflection may lack. However, in the long run the skills are much more important for students than any specific theory or information.

The degree of instruction will vary with the standing and experience of the class. Action research allows upper level students, especially honors students and economics majors, to polish and build upon their existing knowledge and abilities. For freshmen and sophomore classes, a more pedagogical applied research that tests and explores the practical basis or application of conventional economic theory, could prove a powerful method for the delivery of learning. Blinder has written, "...we might be able to learn something more if we opened our eyes and ears and listened a little more to the subjects who populate the economics we study, the people who *actually* do the things we *theorize* about (Blinder, 1 990)".

Special attention must be paid to the makeup of groups. For cooperative learning, three to five students is best. Small groups yield a greater likelihood of close relationships, full participation, and shared leadership. Larger groups, however, provide a larger pool of necessary knowledge, talent, experience, and effort. Given a class's makeup, effort must be made to assure that all groups have a good heterogeneous mix of ability, experience, ethnic background and gender (Hike, 1990; Jacques, 1 985).

There are other considerations. Organizing and working with action research groups can take more time than other methods, putting added pressure on the teacher. If such issues are not dealt with, action research group learning will not prove better than other, less dynamic methods.

Description of the Process Used

Action research groups were used successfully in an honors economic policy course. Groups were formed at the start of the semester and given the task of selecting a potential action research area from the topics covered in the course syllabus. In the first week of class, readings on action research, economic policy, and decision-making were assigned and used as the bases for class discussion. Lectures were given on action research and applied economic theory. Groups then met to select and begin to develop the action research project they would work on for the semester. Throughout the semester, the groups worked on their research in collaboration with the instructor. Several class periods were set aside for groups to explain their research and progress to the other students. In these sessions it is important to put emphasis on research techniques and theory. The project ended in the last week of class, with each group presenting their findings and action plan to the class. The presentation had to be persuasive enough to secure public support for the implementation of the plan. Although it is unlikely that an action research assignment could be seen through to implementation in a semester, planning action that could actually be accomplished is important.

The influencing of economic policy does not have to end with the final exam.

Sagor (1992) sees the process of collaborative action research as having five sequential steps: problem formulation, data collection, data analysis, reporting of results, and action planning. The steps can also be listed as: preliminary diagnosis, data gathering, data feedback, data exploration, action planning, and action by group members (Training, 1 990). However the process is spelled out, if action research is to be an effective student learning tool, literature searching and theory application must have a role throughout the procedure.

The form "Econ Action Research Project" is to be used by each group as the first step in identifying and plotting action research. As the project is developed, a new version is submitted each time the group meets with the instructor. The sequence of the items is somewhat important. But, even more important is that each consideration be addressed several times as a possible plan of action is examined, formulated, researched, and analyzed. The value of keeping action research on track cannot be over-emphasized. Thinking in terms of cause and effect relationships is a skill many students need to hone. The term "~~Possoble Solutiens~~" is presented in this form to confront a tendency to start with a favored solution to an alleged problem and perform what might be called reverse research. Action planning cannot begin until the problem has been defined, the literature has been reviewed, and the data has been gathered and analyzed.

Assessing and Grading Research Group Work

Students should be made aware of how their grade will be determined before the action research process starts. This will require outlining the criteria that will be used to judge the successful completion of the research. Conventional grading strategies will have to be changed for research groups. The determination of the weight to be given to the group project, compared to individual contributions to its success, is problematic for both the instructor and the students. For example, students might protest that a single group grade is not fair. However, if the group process has been well-monitored and the experience of working in a cooperative group goes well, student views of the chosen grading process will mature. Research group members must realize that they are in control of their grade through successfully meeting the established assignment goals (Hike,1990).

Econ Action Research Project: Report ____________________

Group Members: ______________ ______________ ______________
______________ ______________

General Topic:

Issue Background:

Literature:

Problem Definition:

Indicators of Problem:

Possible Cause/Effect Relationships:

Theory/Hypothesis:

New Information Needed:

Next Steps:

~~Possible Solutios~~

Group Econ Action Research Project Analysis **Group** ________

COMMENTS:

How well does this group's process meet these decision guidelines, spelled out in the Harvard Case "Conflicting Responsibilities"?

What are the crucial facts?	exceptional	okay	weak
Who should participate in the decision process?	exceptional	okay	weak
Which course of action best meets basic social policy obligations?	exceptional	okay	weak
Which course of action will do more good than harm?	exceptional	okay	weak
What can we actually accomplish?	exceptional	okay	weak
What are the major steps in the plan of action?	exceptional	okay	weak

- How well did this group's presentation serve as a learning experience?
- How helpful and useful were instructional materials and handouts?
- How well were these matters addressed:
  - Problem Definition
  - Indicators of Problem
  - Cause/Effect Relationships
  - Theory/Hypothesis
- How well did this presentation stimulate your interest in this issues?

Hike (1990) suggests that a part of the cooperative learning process should involve an analysis of how well the task was completed. These assessment forms, for use within the group, are based on Hike's work. Given the length and intensity of the action research process, such analysis should be done more than once, as the assignment advances.

Personal Assessment Form

I participated in each activity.	Always	Occasionally	Never
I critically listened to others.	Always	Occasionally	Never
I valued the viewpoints of others.	Always	Occasionally	Never
I came prepared to meetings.	Always	Occasionally	Never
I was open-minded.	Always	Occasionally	Never
I actively took part in meetings	Always	Occasionally	Never
I dominated the discussion	Always	Occasionally	Never

Group Assessment Form

We had a clear understanding of task objectives and procedures.	Always	Occasionally	Never
We assigned tasks to each group member.	Always	Occasionally	Never
We worked cooperatively as a group.	Always	Occasionally	Never
We discerned the group process.	Always	Occasionally	Never
We confirmed each other's understanding.	Always	Occasionally	Never
We had confidence in our ability complete our task.	Always	Occasionally	Never

These assessments by the research group will be of value to both the student and the instructor.

The Harvard Business School published a paper on the issues of values and ethics in managers' decision-making called, Conflicting Responsibilities (Harvard, 1 993). The paper builds on the premise that business decision-makers often cannot rely on market forces or law alone for guidance. The paper states that "...In the face of uncertainty and conflict, managers must decide and act, and make sure their decisions are implemented." In such common "real world" cases, the final action will often be a balancing act. This is a wonderful description of the environment in which students will get to use their economic understanding.

The Harvard paper provides an excellent guide to the substance of action research, a framework for an action research project, and an outline for assessing a group project. A series of questions is presented to help in developing, refining, and testing a plan of action. The analysis is offered as a way to get a "feel" for the situation, determine the viable options and justify a decision (Harvard, 1 993).

The questions are:
What are the crucial facts and assumptions?
Who should participate in the decision process?
Which course of action best meets my basic obligations?
Which course of action will do more good than harm?
Which course of action can I live with in good conscience?
What can we actually accomplish?
What are the major steps in the plan of action?

All these questions would be important to any action research group. The questions dealing with facts and assumptions, the balance of good and harm, realistic accomplishments, and the plan of action, have particular economic policy connotations. The following assessment form, based, in great part, on the Harvard case paper, can be used by a research group in their process. It can, also, be used by the class in their appraisal of each group's class presentation and by the instructor as part of the grading process. The case paper works well as a basis for class discussion during the teaching leading up to the start of the action research tasks.

Conclusion

Action research can be used to provide a compelling link between the theory and information that the syllabus requires and the familiar realities students will address long past graduation. Such learning activity more closely relates to what students will do in their professional lives. Action research allows students to practice the way economists try to teach them to think while they are learning.

Lectures are most often used in college teaching. They are the simplest medium for presenting theory and information. Lectures are easier to plan for than action research groups. However, cooperative group learning, built around action research, is a way to actively engage students. Many instructors recall that they didn't fully understand what they studied in graduate school until they tried to teach it to others. In action research groups students can learn by teaching each other. Cooperative learning can be a rewarding and effective technique for the advancement of economic understanding.

References

------, Action Research: Harnessing the Power of Participation, Training, Vol. 27, no. I (January 1990) pp 85-87.

Allender, Jerome S. (1982). Affective Education. in Encyclopedia of Educational Research Mitzel, Harold E. (ED), The Free Press, New York.

-------9 (1993). Conflicting Responsibilities. Boston: Harvard Business School Press.

Blinder, Alan S. Learning By Asking Those Who Are Doing. Eastern Economic Journal, XVI, (4) (October-December 1990) pp. 297-306.

Bogdan, Robert C. and Biklen, Sari Knopp (1982). Oualitative Research For Education. Boston: Allyn and Bacon, Inc.

Hike, Eileen Veronica. (1990). Cooperative Learninct. Bloomington: Phi Delta Kappa Educational Foundation.

Israel, Barbara A., Schurman, Susan J. and Hugentobler, Margrit K. Conducting Action Research. Journal Of Applied Behavioral Science. 28 (1) pp. 74-1 01

Jacques, D. (1 985). Group Teaching in Higher Education. in The International Encyclopedia of Education, Hasen, Torsten; Postiethwaite, T. Neville (EDS.), Oxford: Pergamon Press Ltd., Oxford.

Kemmis, S. (1985). Action Research. in The International Encyclopedia of Education , Hasen, Torsten; Postlethwaite, T. Neville (EDS.), Oxford: Pergamon Press Ltd., Oxford.

Lindblom, Charles E. and David K. Cohen (1979). Usable Knowledge. New London: Yale University Press.

Mirabile, Richard J. (November, 1988). Using Action Research to Design Career-Development Programs. Personnel. pp. 4-11

Sagor, Richard (1992). How To Conduct Collaborative Action Research. Alexandria, VA: Association for Supervision an Curriculum Development.

A Computer-Based Research Project For An Undergraduate Course In Development Economics: Discussion And Evaluation

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The AEA Committee on Economic Education's report on the state of the curriculum for the undergraduate economics major said:

> An economics major should be able to analyze (complex) problems involving dimensions of scarcity. This typically involves decomposing problems in ways that highlight behavior, constraints, tradeoffs, and feedbacks. Because the quality of economic analysis is determined by the accuracy of the descriptions of behavior and the reliability of the forecasts made on the basis of these descriptions, students must become acute observers of the world; and they must be able to collect and use data to specify and assess relationships. (Siegfried et. al., p. 214).

The following project, designed for an upper-level undergraduate course in development economics, allows students the opportunity to acquire some of these skills.[1] It was first assigned to students at Hood College in the Fall of 1993. The project could be modified for other courses that focus on international issues, including international economics and comparative economic systems.

Rationale for the Project

The immediate motivation for designing this type of project was disappointment with the quality of term papers and honors theses over the years. Too often students were unable to discern what economic theories or models were appropriate for analyzing particular situations. Even when they knew the appropriate theory to apply, they often did not know what information or data they needed to gather in order to see the extent to which theory illuminated the situation in question.

Such experiences indicate that assigning a term paper and sending the student off to the library does not always achieve the desired learning outcomes. In contrast, the research project described below encourages the student to formulate a general theoretical model or framework **before** he or she begins to collect information about a specific issue or circumstance (in this case, a county which has had difficulties repaying its international debt). In this way, the general theoretical model or framework guides and directs the research. Further, the project gives the student the opportunity to use some of the tools economists employ in applied work, namely numerical data from published sources and computer software. The project is designed so that the student uses the tools as **part** of the research project; that is, the student uses the tools as a **means** to help uncover information relevant to the topic he or she is researching. The tools do not become ends in themselves. The project proceeds in several stages so that the students receive adequate guidance and feedback along the way.

The project was implemented in the Fall of 1993 with the following goals:

Goal One: To acquaint students with the sources of data for developing economies, to encourage them to use computer software, including spreadsheets, to calculate meaningful economic indicators based on the data, and to teach them to present the data in charts and graphs.

Task: Students collect and analyze a set of data from published sources.

Goal Two: To encourage students to develop their reasoning skills and to begin learning to "think like economists."

Task One: Students use a general theoretical model or framework to guide their analysis of and research into a real-world economic event.

Task Two: Students use a computer simulation model which requires that they project values of input variables and generate and interpret forecasts of output variables.

Goal Three: To have students write a research paper that incorporates and integrates economic theory, numerical data, and economic forecasts into the analysis.

Task: Students research one country's experience during the third world debt crisis and write a paper discussing their findings.

Requirements and Structure of the Project

The third world debt crisis of the 1980's had a seminal impact on the political structures, economies, and development strategies of many developing countries. It also influenced the way economists and international agencies like the World Bank view the problems of developing economies. Thus, it provides a convenient theme around which to organize a class project, much as one might use a similar topic as a theme for a conference or book.

The seven students in the Fall 1993 development economics class each chose one developing country which had problems with international debt in the 1980's.[2] Each student then studied the causes and consequences of the debt crisis in his or her country. Having students study one particular well-defined issue made it easier to monitor their progress and provide them with guidance than if they all worked on different issues. It also encouraged students to consult each other since they were using many of the same research sources and tools.

The project proceeded in several phases, with graded assignments in each phase, so that students did not wait until the last minute. The object of **phase one** was to introduce students to the sources, manipulation, and presentation of data (**goal one**). The students collected a set of basic economic indicators for their country for the period 1970 to 1991. All the data could be obtained from readily-available World Bank and IMF publications, such as The World Debt Tables, The World Tables, and The International Financial Statistics. The data set included 25 variables selected for the students in advance. They included GNP per capita, growth rates of GNP or GDP, the size of international debt, debt service ratios, and other variables related to the structure of the economy and the debt crisis. The variables were chosen for the students rather than by the students themselves so that they could start compiling their data sets early in the semester before they had done extensive research on their countries. None of them were familiar with such data so this gave them plenty of time to correct errors and fill in any gaps in their data series. They were encouraged to include additional indicators that they thought were relevant or interesting.

Appendix I shows the form given to them to use as a basis for reporting their data. The period between 1970 and 1991 was divided into three subperiods loosely corresponding to "pre-debt crisis" (1970-81), "debt crisis" (1982-89), and "post-debt crisis" (1990-91). The students were to compute simple averages of the variables for each subperiod. The purpose of reporting averages for the subperiods was to isolate the impact that the debt crisis had on growth, investment, inflation, exports, imports, and so on. They were not required to use a spreadsheet, but were strongly encouraged to do so because a spreadsheet would allow them to store the data collected for each year in a compact fashion, calculate easily the various ratios and growth rates from the raw data and average them over the subperiods, and graph the trends in the indicators. In addition, they were to document their sources carefully, note any peculiarities of the data (such as years for which observations were missing), and report the formulas they used to calculate indicators like growth rates and inflation rates from the raw data.

The **second phase** of the project was designed to allow them to start "thinking like economists" (**goal two**). The students revised their data, based on errors and deficiencies uncovered in a review of the data they compiled in phase one. They were also asked to describe in words how the various indicators, like growth and inflation, had moved over the period. While this may seem like a simplistic, tedious exercise, students often are overwhelmed and confused by lists of numbers. Encouraging students to interpret numerical data in words makes the data come alive as they realize what real-world phenomena they actually represent. It is also the first step in logically connecting the phenomena measured by the data to economic theories that allow the identification of causal factors.

With the explicit objective of starting them on the journey toward "thinking like economists" (**goal two**), the students were asked to make a preliminary effort to explain why the data moved as they did over the period. By this time, the class had already studied the theoretical linkages among international trade, finance, and development. The students had also explored the nature of the debt crisis in general terms, and read analyses of the crisis by economists. They were given a handout outlining the experiences of a "typical" debtor country. Armed with a general knowledge of how the economy of a typical debtor nation behaves, they were expected to outline formally (that is, in writing) the course that the economy of a typical debtor nation follows. This would constitute the general theoretical model that they would use to guide subsequent research and to organize their research report. Since the theoretical model of a typical debtor nation, properly formulated, implies that economic indicators, such as GDP growth, exports, and imports, will move in certain directions, they were to compare the movement in the economic indicators they had compiled for their countries with those predicted by the theoretical model. In turn, this would provide questions that they could address in their subsequent research. For example, if several of a county's indicators did not behave as predicted by the theoretical model of the typical debtor nation, the student could direct his or her research toward uncovering policies and other events that account for this.

The **third and final phase** of the project had two objectives. The first was to continue the development of the students' reasoning skills (**goal two**). The second was to get them to integrate their data and a forecast into their papers (**goal three**). The students were to write a research report discussing the origins and causes of their nation's debt difficulties, the adjustments their nations had made as a result of debt problems, and the economic, political, and social impact of the crisis and the adjustments made. They were to consult standard references (books, articles, embassies, international agencies), but also were expected to use the data sets they had collected as references. In other words, they were to use the trends in the various indicators in their data sets to help explain and illustrate the causes and consequences of the chosen country's debt difficulties. As a result, they would end up integrating the data they had collected into the paper. The students were allowed to decide how many of the variables in their data sets to include in their papers, how to incorporate them into the general discussion, and how to present the information (graphs or tables).

The theoretical model of the typical debtor country would serve as a guide to organizing the discussion in their papers. Ideally, the finished report would start with a general discussion of the debt crisis, including an outline of the experience of the typical debtor-nation, which would be used as a basis on which to evaluate the chosen country's experience. Then the paper would discuss the background of the particular nation being analyzed. The paper would go on to examine how that country fell into debt difficulties, how it adjusted to its debt difficulties, and how it was affected politically and economically. In this section, the writer would compare the particular country's experience with that of the typical debtor-country, and discuss why it did or did not conform to the usual pattern. The final section would discuss the nation's future prospects.

Finally, in the third phase, the students were to develop their reasoning skills further by using a debt simulation model. The model, based on the balance of payments account, was programmed for the computer by Elizabeth S. Adams of the Department of Mathematics and Computer Science at Hood College. It allowed the students to forecast the potential for each of their countries to experience debt servicing difficulties in the future. A discussion of the model and its results was to be integrated into the final section of the paper which would explore each country's future political and economic prospects.

The Debt Simulation Model

The use of the debt simulation model was a key ingredient of the project. The major purpose, as stated in goal two, was to enhance the students' reasoning skills. Economists often make projections about the future and this exercise provided an opportunity for the students to experience making the kinds of judgments and decisions that this entails. In the process they also would see the limitations of economic forecasts and projections. Finally, it was a chance for them to do some original analysis rather than simply regurgitate the ideas of others. Since this was one of the more unusual and difficult aspects of the project, it is worth additional discussion.

The debt simulation model requires that the user provide information about future exports, imports, foreign direct investment, borrowing terms (including interest rates, grace periods, and repayment periods), and the initial debt position. The program then calculates new borrowing, new debt levels, and scheduled debt service (principle or amortization plus interest) for a five-year forecast period. The key output variable calculated for each forecast period (normally a year) is the **borrowing requirement**, which is new borrowing from foreign creditors. The following formula shows in shortened form how the program derives it for each forecast period t:

BORROWING REQUIREMENT [t] = AMORTIZATION DUE ON DEBT TO OFFICIAL CREDITORS [t] + AMORTIZATION DUE ON DEBT TO PRIVATE CREDITORS [t] - BALANCE ON CURRENT ACCOUNT [t] - CHANGE IN FOREIGN RESERVES [t] - NET FOREIGN DIRECT INVESTMENT[t].

where, BALANCE ON CURRENT ACCOUNT [t] = EXPORTS OF GOODS AND SERVICES [t] - IMPORTS OF GOODS AND SERVICES (excluding INTEREST DUE) [t] -INTEREST DUE [t] + NET TRANSFERS [t].

According to the formula, the borrowing requirement is calculated as a residual after accounting for all other items in the balance of payments. This follows from the fact that the balance of payments account is based on an accounting identity which says that the debits (**uses** of foreign exchange funds) must equal the credits (**sources** of foreign exchange funds). In the above formula the borrowing requirement is a source of funds. Thus, assuming other variables constant, increases in items that represent uses of foreign exchange, such as amortization due (principle) and deficits on current account (to which imports and interest due on foreign debt contribute) require additional sources of funds and therefore increase the borrowing requirement. Increases in items that represent sources of foreign exchange, such as a surplus on current account and positive net foreign direct investment, provide additional sources of funds and thus decrease the amount that must be borrowed from foreign creditors, other things constant. The borrowing requirement provides the basis for estimating future debt levels, which in turn form the basis for estimating future principle and interest payments. The program also calculates two ratios that indicate the burden of the debt (that is, that allow the user to judge whether a given country will have difficulty repaying the debt): the debt-to-export ratio and the debt service ratio. The chart below summarizes how the model works.

INPUTS: EXPORTS, INITIAL DEBT LEVELS, ETC.

|

|

OUTPUT: BORROWING REQUIREMENT

|

|

OUTPUT: NEW DEBT LEVELS, DEBT BURDEN

| |

DEBT SERVICE RATIO

DEBT EXPORT RATIO

Since the output variables are based on accounting identities and other simple formulas, the model is fairly easy for students to understand conceptually. Despite its relative simplicity, the model is flexible enough to allow the user to analyze and compare a variety of debt-scenarios. For example, the model "permits" the debtor-country to accumulate arrears, reschedule debt from private and official creditors, and have some of its debt forgiven. It also allows the user to factor in the impact of changes in world interest rates and of conditions that affect the ability of a country to export and import.

Each student was required to make a **baseline forecast** of his or her country's debt and debt service. To keep things simple, the baseline forecast merely assumed that past trends would continue in the future. Thus, the input values for future exports, imports, foreign direct investment and so on were based on simple extrapolations of past trends in those variables. Then each student was to make **one additional forecast** in which an "extraordinary" event that alters past trends takes place. The event could be a debt rescheduling, a round of debt-forgiveness, a significant increase in exports, or a change in foreigners' perceptions of the country's future prospects which affects foreign direct investment. Each student could choose his or her own "extraordinary" event based on research. The events the students chose were:

Argentina:	A resurgence of inflation.
Brazil:	A return of the high export growth rates of the 1970's.
Chile:	The economic slowdown in Chile continues through 1995.
Egypt:	The impact of the recent debt-forgiveness.
Mexico:	The impact of NAFTA.

Peru:	Stabilization policies cause a large sustained increase in foreign direct investment.
Philippines:	Foreign direct investment reaches President Ramos' goal of $1billion by 1994.

Appendix II includes a list of the input variables required for the simulation model. Appendix III includes a printout of the program output. The students were given a handout describing the nature of the model and how they were to incorporate it into their papers. The handout, available from the author upon request, includes definitions of the input and output variables, step-by-step instructions for running the model, and suggestions for estimating the input values that the model requires.

To ensure that the students adequately understood the workings of the model, two full 75-minute classes were devoted to discussing it, including one class in the computer lab. In the lab class the students received four sets of input data for a hypothetical debtor-country. One set provided data for a baseline forecast and the others included all the same data as in the baseline case except for one of three "extraordinary" events: a rescheduling of principle, a round of debt-forgiveness, and a sharp increase in foreign direct investment. After the students ran the model with the four sets of input data, they could use the output data to compare the debt service burden in the baseline case with the burden generated by the three alternative scenarios. These exercises allowed the students to solidify their understanding of how various international transactions and events affect the amount and burden of international debt which a country incurs. The exercises also allowed them to enhance their understanding of how the model generates the output variables.

Appendix II, which lists the input variables that the model requires, reveals that the user must generate a great many variables before the program can be utilized. This task is not as arduous and time-consuming as it may seem on the surface. First, all of the input variables can be extrapolated from data that appear in the World Tables and World Debt Tables. Of course other sources can and should be used, but restricting the number of basic sources reduces the amount of work. Second, the user will not utilize all of the input variables in any given run and therefore will enter zeros for those variables. For example, principle reschedulings, debt forgiveness, and changes in arrears fall under the category of "extraordinary" events and will not be invoked all at the same time.

Appropriateness of the Project for the Students

An elaborate project such as this can be incorporated most effectively into a small class. When students have little experience working with data and computers, the instructor must spend a lot of time with individual students in order to ensure that they have a satisfying learning experience. Thus, the economic development class at Hood College, with only seven students, afforded the perfect opportunity to introduce this project.

A further reason for introducing the project into the development class was that it was an elective, rather than a required, course. All the students had a strong interest in the subject which helped motivate them to do their best.

All seven students had studied Principles of Microeconomics and Macroeconomics. Four of them were simultaneously taking other upper level economics classes or had done so in previous semesters. Four of them were majoring or minoring in economics and one was pursuing an international studies major which involved taking several economics courses with an international focus. While their interest in development economics was strong, their quantitative and mathematical backgrounds were not (only two had studied calculus). Statistics is not a prerequisite for the course, which precluded requiring that the students use statistical techniques like regression. In this context, the fairly modest requirements with respect to the use of quantitative tools (the data set and the computer simulation model) seem reasonable.

Evaluation of the Project

The results of the project in achieving the three learning goals were mixed. In addition to the impressions of the instructor, this conclusion is based on interviews conducted with the students after the end of the semester.

Goal One: To acquaint students with the sources of data for developing economies, to encourage them to use computer software, especially spreadsheets, to calculate meaningful economic indicators based on the data, and to teach them to present the data in charts and graphs.

The students unquestionably became familiar with the World Bank World Debt Tables and World Tables, two major sources of macroeconomic data for developing countries. Compiling the data set and having to project input variables for the simulation model ensured that they would have to refer to the data sources more than once.

The students often encountered difficulties turning the raw data they collected from the World Bank sources into meaningful economic indicators. For example, they had to calculate annual percentage changes in real GDP to use as growth rates. Some were not sure how to calculate percentage changes. Other difficulties included making sure that the units in which the data were measured were comparable for calculating ratios and interpreting numbers expressed in scientific notation. This latter problem arose because, for nations that have recently experienced high inflation, price indices for earlier years are so small that they are reported in scientific notation.

None of the students had ever used a spreadsheet before except in classes which provided spreadsheet instruction and in which assignments with them were very mechanical. Some of the students started out calculating the economic indicators using calculators, but they quickly tired of it. By the time they got to phase two of the project (revising their data sets), they all were learning how to use a spreadsheet. When they turned in their data sets after phase two, they not only reported their data in the summary form requested (see Appendix I), but all of them included some additional charts or graphs illustrating year-to-year trends in the data generated by using a spreadsheet.

By and large, the goals of the data collection exercise were achieved and the students were unanimous in reporting that they learned a lot. They acquired data-collection skills and insights on which to build in the future. They saw how published sources present data series. They said that they learned how difficult it can be to choose what data to report, especially when data do not always come in the forms one needs and sometimes are not available at all. Perhaps most importantly, they learned the power and usefulness of spreadsheets.

Goal Two: To encourage students to develop their reasoning skills and to begin learning to "think like economists."

To achieve this goal, students were supposed to use a theoretical model of a typical debtor country to help explain or illustrate the individual country experiences, including the trends in the indicators in their data set. The students clearly needed additional guidance in doing this. The in-depth exploration of the third world debt crisis in class did not provide enough of a basis for them to construct a model of debtor-country experience on their own and use it as a framework within which to evaluate their country's experience.

When they handed in their revised data sets, their attempts to explain why the indicators moved as they did often did not refer back to the model of the typical debtor nation. They were expected to make statements such as: "Imports of goods typically fall in nations experiencing debt difficulties because foreign exchange must be diverted to meeting debt-service payments and because of the policy adjustments the IMF requires. The data on imports for Country X show that......., which is [or is not] the case for the typical debtor-nation." Statements like this were not the norm either in discussions of the trends in the data in phase two of the project or in the final research paper. Several students said that they felt lost as they attempted to explain the trends in the indicators in their data sets. The student analyzing Chile's economy, however, did demonstrate a clear understanding of the typical debtor-country's experience. He recognized soon after he began to collect his data that the Chilean economy was not as damaged by the debt crisis and recovered much more quickly than the typical debt-troubled nation. In his final paper, he explored the reasons for this.

The use of the debt simulation model also was supposed to help students begin to "think like economists." To a large extent, this appears to have occurred. The students learned a lot from the class discussion of the four exercises for a hypothetical debtor nation that were devised to teach them how the model works. They solidified their understanding of the impact of various international transactions on a nation's accumulation of debt and they gained enhanced insight into some of the technical aspects of the debt crisis and its aftermath. For example, a few weeks before they were introduced to the debt simulation model, the class studied the devices employed by the industrial-country creditors to alleviate the debt crisis.

We discussed in an intuitive way the differing impacts of debt rescheduling and debt forgiveness on a nation's debt and debt service burden. At the time, the students appeared to understand the differences. However, when the students compared the output of the debt-rescheduling exercise with that of the debt-forgiveness exercise, they expressed some surprise that debt forgiveness reduced future debt and debt service permanently while debt rescheduling did not reduce the total amount of debt outstanding and only delayed the payment of debt service.

They also seemed to appreciate the limitations of forecasting based on computer models. We spent time discussing how the debt simulation model differed from the "real world" of international transactions and debt, and about the compromises and simplifications made in designing the model. The bottom line, as any forecaster knows, is that any projections made with such models are going to be inaccurate. The students initially were a little disconcerted about this, but they eventually appreciated that all computer models are somewhat unrealistic and that all forecasts contain some probability of error. A good analyst recognizes this, and candidly discusses the assumptions and judgments he or she makes in constructing models and in generating input data.

The students had little difficulty learning how to run the model on the computer, though much can be done to make the model more "user-friendly." However, they did have problems determining an "extraordinary" event that might occur in their countries in the future that could be used as a basis for generating an additional forecast to compare with their baseline forecast. Most of them were unable to discern an event or policy from their research that was likely to have an impact on future balance of payments transactions. Once they did decide on an alternative scenario, several of them were unsure about which of the simulation model's input variables to adjust. That they had these difficulties is not surprising since these are the kinds of tasks where the judgment, knowledge, and experience of an economist come into play. A major goal was to get them to engage in this sort of analysis for the first time. However, it was necessary to spend a considerable amount of time outside of class with each of the students to get them on the right track.

Even if the students did not fully develop their ability to make the kind of judgments needed for making projections (and one exercise is unlikely to accomplish this), using the debt simulation model gave them an appreciation of the effort involved. However, the exercise could have yielded more fruit if that the students had more time to work with the debt simulation model. In this case, the students did not receive instructions in running the model until two-thirds of the way into the semester. They also were not required to hand in an assignment using it, as was the case with the data set they collected. Not surprisingly, many of them saved the generation of input data and selection of their additional forecasting scenario until the last minute. This left them little time and no incentive to think carefully about how they should use the model in the context of their paper and to try to work out their difficulties themselves before seeking the instructor's guidance.

In sum, the students experienced a beneficial first attempt at "thinking like an economist," but improvements in the project design are needed in the future. Particularly, the students require more guidance in formulating a general theoretical model or framework that will guide their subsequent analysis, and they need incentives to work with the debt simulation model in a more timely fashion.

Goal 3: To have students write a paper on their research topic that incorporates and integrates economic theory, numerical data, and economic forecasts into the analysis.

The quality of the papers was better than usual. The papers had a clear focus: the causes and consequences of a particular country's debt difficulties. They were generally well-organized and followed a logical progression: historical, political and economic background on the country, causes of the debt crisis, effects of the crisis and the country's efforts to adjust to it, and prospects for the future. They did not, however, regularly refer back to the theoretical model or framework of a typical debtor-country in their discussion of individual country experiences.

Yet, the students clearly gained a much more detailed and in-depth understanding of the role of debt in a developing country and of the processes of economic adjustment and restructuring, a topic that often dominates policy discussions today. This was obvious when two experts on China visited the class to discuss the recent Chinese economic reforms. Among the questions the students asked were rather detailed ones regarding the nuances of exchange rate policy and new forms of ownership and control of Chinese companies.

The students did a fair job integrating the data set they had collected into the paper. They included charts and tables illustrating the data. All of them referred at some point to various indicators in their data set when discussing the performance of their country's economy. However, in a few instances they would discuss trends without referring to relevant indicators in their data set even though doing so would have made the discussion clearer. One student, however, went above and beyond the call of duty and included charts and tables of indicators that were not part of the original data set, but which were relevant to the particular issues she was discussing.

The results of the debt simulations could have been integrated more smoothly into the papers. Most of the students did not describe clearly what information the debt simulation model gave (a sense of the extent to which debt and debt-servicing problems are likely to plague their country in the future), nor did they describe and justify in much detail the assumptions they made to generate the input data. In most of the papers, the exercise based on the debt simulation model seemed like an afterthought that did not fit into the overall discussion. This undoubtedly resulted from the fact that the students waited until the last minute to generate the input variables for their forecasts. Thus, goal three was partially achieved. Students turned in well-organized, coherent papers, but did not integrate the general model of a debtor-country and the computer simulation model as well as was expected.

Improving the Learning Outcomes in the Future

This project gave the students a good introduction to some of the tools that economists use in their analyses and to the way economists think. Perhaps the major lesson of this experience for instructors contemplating similar projects for their own classes is that, at the beginning of the project, students should be actively involved in choosing or formulating appropriate theoretical models or frameworks which will help direct their subsequent inquiries into particular economic events. Teaching them how to collect data and use computer tools is important, but using the tools should come after theoretical models have been constructed and testable hypotheses have been generated, so that students learn that tools are means to an end and not the end itself. The following suggestions are directed toward improving the learning outcomes.

1. The first phase of the project should actively involve the students in constructing a general framework or model and generating testable hypotheses from it.

As mentioned, the students had difficulty evaluating individual county experiences in the context of a theoretical model that outlines the experience of the typical debtor-country. They need more guidance in choosing and formulating theoretical models and frameworks and in using them to guide their subsequent research into real-world situations. One student[3] said that she would have gotten more out of the project if, immediately after the material on the debt crisis had been covered in class and before the collection of the data sets, she and the other students had been required to summarize the typical debtor-country experience and generate a few hypotheses to "test" in the context of their chosen countries. Then a group discussion could have allowed the class to reach a consensus about the typical debtor-country's experience and about the hypotheses and questions that they should consider as they research the extent to which individual countries conformed to the typical debtor-country experience. This way the students would get some experience formulating a theoretical model and generating hypotheses to test on their own, but they also would get the benefit of the instructor's guidance so that their subsequent research takes fruitful directions.

2. The students should participate in the selection of the economic indicators that they compile in the data collection phases of the project.

The economic indicators that the students collected from published data sources were chosen for them. In retrospect, the students should help decide what indicators they need. This could follow naturally from the class discussion that reaches a consensus about the experience of the typical debtor-nation, as mentioned above. After generating hypotheses which follow from the model, the class could discuss what macroeconomic indicators they might use to address the issues posed by the hypotheses. These would then form the basis of the indicators they collect. This gives them some experience choosing the indicators they will use to test the hypotheses, an essential part of applied research. As a result they will better understand why they are compiling specific indicators.

3. Students should be required to turn in assignments using the computer simulation model before the paper is due.

The students saved their analysis with the computer simulation model until the last minute and their discussion of the model's results seemed out of context. The debt simulation model should have been introduced earlier in the semester to allow the students more time to familiarize themselves with it. Further, students should have been required to turn in at least one assignment utilizing it. For example, in the future, they might be asked to prepare a set of input data for their baseline forecast several weeks before the final paper is due. These steps would help ensure that the students think about and use the model before the last minute. In turn, their discussions of the model in their papers would improve.

Costs and Benefits

The potential benefits generated from a well-designed research project are substantial, though not all of them are quantifiable. The development economics students who undertook the project learned valuable computer and data collection skills which many of them will refine and utilize in their future academic and professional lives. They also received an introduction to the process of "thinking like an economist." They were exposed to the effort required to put together an economic research report. They received a sense of satisfaction from analyzing an issue that is currently relevant.

A research project so elaborate, however, also imposes substantial costs on both students and instructor. First of all, it requires that students and teacher devote considerable time and effort to it outside of class. The students all said that they had never done such a detailed and time-consuming project before and sometimes felt overwhelmed. Since the students had never collected a set of time series data before and had only limited knowledge of spreadsheets and other computer tools, they needed to spend time acquiring those skills. Further, the time they spent learning how to use spreadsheets and trying to figure out how to make elementary calculations was time not spent thinking about the economics of the debt crisis. The instructor also must spend a considerable amount of time outside of class helping students.

Second, the project necessitates that some class time be devoted to it. In this case, the class spent two full sessions (one week) learning the debt simulation model. This was necessary to ensure that the students adequately understood the model's logic. We also spent parts of several other classes, the equivalent of about one additional 75-minute class, discussing the data collection exercise, how to use the data as part of the papers, and where to find articles and books about the debt crisis. Utilizing class time to discuss the project results in the sacrifice of "breadth" of course coverage for "depth." It reduces the amount of material on other topics that can be covered in class.

In the final analysis, instructors that assign substantial research projects must weigh the benefits against the costs. Some steps can be taken to reduce the costs. For example, better instructional materials can be devised so that students can learn how to use some of the tools on their own. More advanced students might be employed as teaching assistants to help instruct students in making calculations using raw data and in using spreadsheets and computer simulation models. Further, students would not have to spend so much of their time simply learning the tools of analysis if instructors had them collect and manipulate data as a regular part of principles and intermediate theory courses. Such exercises are particularly well-suited to macroeconomics courses because of the availability of macroeconomic time-series data. In addition, since the spreadsheet as a calculating tool is to this generation of students what the calculator was to the previous generation, it is important that instructors design exercises that utilize the spreadsheet even at the principles level.

The effort an instructor has to put into designing an integrated research project, motivating the students, and guiding them through the sometimes muddy waters of research can be worth it. It is immensely rewarding to see students excited by research, as the students who did this project were, and to know that they are beginning to appreciate the skills required to be a good economist.

APPENDIX I
DATA COLLECTION

EVERYONE SHOULD COLLECT THE FOLLOWING INDICATORS:

	1970-81	1982-89	1990-?
GNP per capita			
Population growth rate			
Growth rate of GNP per capita			
Share of Total Output:			
Primary			
Secondary (Industry)			
Tertiary (Services)			
Gross Private Domestic Investment as a % of GNP or (GDP)			
Exports of Goods and Services as a % of GNP (or GDP)			
Growth of exports			
Imports of Goods and Services as % of GNP (or GDP)			
Total Stock of Foreign Debt Outstanding			
% of foreign debt owed to private creditors (banks, bonds)			
% of foreign debt owed to official creditors (governments, World			

Bank, and other
development banks)

Ratio of Debt to Exports

Ratio of Debt to GNP (or GDP)

Debt Service Ratio (Principle
+ interest owed divided
by exports of goods and
services)

Direct foreign investment (in
millions of $)

Unemployment rate

Inflation rate

NOTE:

1. I would like everyone to collect data on these variables so that, when we exchange data with each other, we have some common indicators to compare. However, **DO** collect other indicators that you are interested in and/or think are important, such as indicators of poverty, growth of agriculture and industry, etc.

2. To construct the data, try to get data for each year within each subperiod and them average across all years in the subperiod to get an annual average for each subperiod. If you **CANNOT** get data for all the years in each subperiod (and you may not be able to), indicate clearly for which years you have data.

APPENDIX II

SHORT TERM DEBT - BEGINNING
OFFICIAL LONG TERM DEBT - BEGINNING
PRIVATE LONG TERM DEBT - BEGINNING
AVERAGE INTEREST RATE - OFFICIAL LONG TERM
AVERAGE INTEREST RATE - PRIVATE LONG TERM
ARREARS - BEGINNING
FOREIGN EXCHANGE RESERVES - BEGINNING
AMORTIZATION ON OFFICIAL DEBT OUTSTANDING
AMORTIZATION ON PRIVATE DEBT OUTSTANDING
CHANGE IN ARREARS [Periods 1-5]
GOODS EXPORTED [Periods 1-5]
GOODS IMPORTED [Periods 1-5]
SERVICES (excl. interest) EXPORTED [Periods 1-5]
SERVICES (excl. interest)IMPORTED [Periods 1-5]
NET TRANSFERS [Periods 1-5]
CHANGE IN FOREIGN RESERVES [Periods 1-5]
NET FOREIGN DIRECT INVESTMENT [Periods 1-5]
ERRORS AND OMISSIONS [Periods 1-5]
CHANGE IN SHORT TERM DEBT [Periods 1-5]
PCT. OF NEW BORROWING - OFFICIAL [Periods 1-5]
GRACE PERIOD - NEW OFFICIAL LOANS [Periods 1-5]
REPAYMENT PER.-NEW OFFICIAL LOANS [Periods 1-5]
AV. INTEREST RATE - NEW OFFICIAL LOANS [Periods 1-5]
GRACE PERIOD - NEW PRIVATE LOANS [Periods 1-5]
REPAYMENT PER.-NEW PRIVATE LOANS [Periods 1-5]
AV. INTEREST RATE - NEW PRIVATE LOANS [Periods 1-5]
OFFICIAL DEBT RESCHEDULED [Periods 1-5]
GRACE PERIOD - OFF. DEBT RESCHEDULED [Periods 1-5]
REPAYMENT PER.-OFF. DEBT RESCHEDULED [Periods 1-5]
PRIVATE DEBT RESCHEDULED [Periods 1-5]
GRACE PERIOD - PVT. DEBT RESCHEDULED [Periods 1-5]
REPAYMENT PER.-PVT. DEBT RESCHEDULED [Periods 1-5]
OFFICIAL DEBT FORGIVEN [Periods 1-5]
PRIVATE DEBT FORGIVEN [Periods 1-5]

APPENDIX III - BASELINE FORECAST FOR HYPOTHETICAL COUNTRY

Short Term Debt [1] is $ 2466.00 (millions)
Short Term Debt [2] is $ 2466.00 (millions)
Short Term Debt [3] is $ 2466.00 (millions)
Short Term Debt [4] is $ 2466.00 (millions)
Short Term Debt [5] is $ 2466.00 (millions)

Scheduled Interest [1] is $ 2477.12 (millions)
Scheduled Interest [2] is $ 2510.80 (millions)
Scheduled Interest [3] is $ 2573.99 (millions)
Scheduled Interest [4] is $ 2659.63 (millions)
Scheduled Interest [5] is $ 2765.21 (millions)

Balance on Current Account [1] is $-1491.12 (millions)
Balance on Current Account [2] is $-1524.80 (millions)
Balance on Current Account [3] is $-1834.99 (millions)
Balance on Current Account [4] is $-2191.63 (millions)
Balance on Current Account [5] is $-2595.21 (millions)

Borrowing Requirement [1] is $ 1856.12 (millions)
Borrowing Requirement [2] is $ 1954.71 (millions)
Borrowing Requirement [3] is $ 2326.14 (millions)
Borrowing Requirement [4] is $ 2759.53 (millions)
Borrowing Requirement [5] is $ 3257.69 (millions)

Scheduled Debt Service [1] is $ 3095.12 (millions)
Scheduled Debt Service [2] is $ 3240.71 (millions)
Scheduled Debt Service [3] is $ 3365.14 (millions)
Scheduled Debt Service [4] is $ 3527.53 (millions)
Scheduled Debt Service [5] is $ 3727.69 (millions)

Debt Service Ratio [1] is 21.36 %
Debt Service Ratio [2] is 22.36 %
Debt Service Ratio [3] is 21.11 %
Debt Service Ratio [4] is 20.12 %
Debt Service Ratio [5] is 19.33 %

Long Term Official Debt Outstanding [1] is $32957.49 (millions)
Long Term Official Debt Outstanding [2] is $33937.33 (millions)
Long Term Official Debt Outstanding [3] is $35165.33 (millions)
Long Term Official Debt Outstanding [4] is $36678.63 (millions)
Long Term Official Debt Outstanding [5] is $38514.80 (millions)

Long Term Private Debt Outstanding [1] is $ 6257.62 (millions)

Long Term Private Debt Outstanding [2] is $ 6502.58 (millions)
Long Term Private Debt Outstanding [3] is $ 6809.58 (millions)
Long Term Private Debt Outstanding [4] is $ 7187.91 (millions)
Long Term Private Debt Outstanding [5] is $ 7646.95 (millions)

Debt Export Ratio [1] is 287.63 %
Debt Export Ratio [2] is 296.09 %
Debt Export Ratio [3] is 278.80 %
Debt Export Ratio [4] is 264.24 %
Debt Export Ratio [5] is 252.13 %

Footnotes

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2. The students chose Argentina, Brazil, Chile, Egypt, Mexico, Peru, and the Philippines.

3. Sheryl Orr made this suggestion.

References

ABDALA, ADIL E. "A Country Report Project for an International Economics Class," The Journal of Economic Education, Summer 1993, 24(3), pp. 197-224.

MCSWAIN, ROBERT. "The EB/PAS Balance of Payments Model," US Department of State, MIMEO.

SIEGFRIED, JOHN J. et. al. "The Status and Prospects of the Economics Major," The Journal of Economic Education, Summer 1991, 22(3), pp. 197-224.

[1] With thanks to the Fall 1993 ECON 317 students at Hood College: Del Carden, Amina Farah, Jairo Gracia, Heather McLaughlin, Sheryl Orr, Lara Rhea, and Julieta Ugaz-Pereda. Their interest, enthusiasm, and patience in the midst of this somewhat chaotic experiment made my job infinitely more enjoyable.

[2] The students chose Argentina, Brazil, Chile, Egypt, Mexico, Peru, and the Philippines.

[3] Sheryl Orr made this suggestion.

Maximizing Output In The Economics Classroom: Integrating Necessary Skills

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Introduction

Today's economics graduates face a world that is changing so rapidly that it is getting more and more difficult to acquire the kind of well-rounded education they need to compete effectively in the labor market. Campuses across the nation are beginning to recognize the significance of and need for student development in areas such as communication, critical thinking and technology. Committees are formed to examine the curriculum, resulting in frustration, as they conclude that the only way to achieve these goals is to increase the number of required courses. Given dwindling resources, and the escalating public dissatisfaction with universities and their teaching effectiveness, this solution lacks appeal. To find a solution, it is necessary to re-examine the problem. This paper describes an approach developed at the University of Missouri-Rolla.

The first step in any problem solving exercise is the identification of the parameters of the problem. With respect to the issue of skill formation, an extensive literature already exists. The U.S. Department of Labor produced a report outlining the skills necessary for youth to succeed in today's world. In Tables 1 and 2, the "Secretary's Commission on Achieving Necessary Skills" (SCANS) provides a useful summary. This list supplies an excellent benchmark for comparison with goals achieved by current curricula. Table 1 comprises the SCANS Foundation Skills, which contains three categories: Basic Skills, Thinking Skills and Personal Qualities. While it is safe to say that basic skills are fairly well covered in college, it is not as obvious that progress is being made in the area of thinking skills or personal qualities. In Table 2, the SCANS Competencies are listed. Economists will look at this list and immediately recognize the skills that are prized by our profession. Yet even they find it difficult to assimilate these competencies into their courses.

The reason for this difficulty is that we tend to use a segmented approach to learning. Students are conditioned to approach their courses as separate, unrelated entities. As a result, many students fail to appreciate the significance of required courses outside their major, sometimes to the point of feeling that their time is being wasted. At the same time, they resent any seepage of material from one discipline into another. For instance, the economics instructor who requires good writing skills will hear "This is not an English class!"

To overcome this mind set, instructors across disciplines must begin integrating skills and knowledge learned in other classes into their existing curriculum. There are several positive consequences from this approach. First, the skills already acquired are practiced, reinforcing them, while at the same time making learning new material easier. Second, as the substance of separate courses is synthesized, a synergism takes place that helps students retain more new information. As a result, the students' knowledge and resource base is expanded.

We have a special obligation in economics to pursue this approach. Not only is economics guilty of using a segmented approach, but there are also obstacles to success that other disciplines rarely face. For instance, students who enter their first economics principles class have seldom had economics in high school. They have, however, had English, mathematics, history and science courses. The student enrolled in a freshman-level science course has already learned basic terms and concepts upon which the college instructor can build. In economics, the principles course is often remedial in nature. Another problem facing economics, that is sometimes shared by other disciplines, is the high numbers of non-majors who populate the principles classes. Keeping in mind that non-majors generally think they are marking time, this adds to the burden the economics instructor faces. Unfortunately, these hurdles, which sometimes seem insurmountable, result in the use of teaching techniques that depend on memorization and regurgitation. The classroom lecture is still the most frequently used teaching tool, and multiple-choice exams are the primary test of learning. These are not efficient ways to overcome these obstacles, nor to help students achieve necessary skills.

Levels of higher-order learning are discussed by Bloom et al. (1956), who describe six hierarchical cognitive categories of learning. They are: knowledge, comprehension, application, analysis, synthesis and evaluation. To achieve the lowest level, knowledge, one needs the ability to recall previously learned information. The highest level of cognition, evaluation, requires the ability to evaluate information based on a set of criteria, and draw conclusions. Unfortunately, the techniques most often used in economics require the student to practice only the lowest-order thinking. At the same time, obtaining SCANS skills requires the highest-order thinking.

Economics Instructors Need to Start Thinking Like Economists

In economic terminology, identifying the source of the problem and the desired goals is equivalent to determining the constraints and the objective function to be maximized. The next step is to identify the resources available to reach a favorable outcome. Too often, teaching resources are thought to be limited to the instructor, the classroom, books, the library, and maybe the computer. The most important resources, however, are the students and the methods with which they learn the material. Without the participation of the student, and teaching methods that exercise higher order thinking, instructors are just 'talking heads,' the classroom is just another crowded, uncomfortable place to sit, books and libraries are boring, and the computer is something to be feared and loathed.

Every student brings useful human capital into the economics classroom, even if they have never taken an economics course. They bring writing and language skills, understanding of mathematics and science, history and perhaps even computers. Economics courses need to be designed to integrate these skills. We must make the student part of the learning process. The most effective way to do this is through the use of active student participation techniques. Writing, computers, analytical techniques, even material from other disciplines can be synthesized into economics. The economics discipline is perfectly positioned for this type of synthesis by virtue of its own history. The early economists were philosophers, who developed economic principles in the context of the written word. Mathematicians put the logic of the words into symbolic form, giving us the graphs and equations that allow us to measure the validity of the logic by testing hypotheses. The introduction of computers makes these tests quick and easy.

Integrating these skills into economics classes helps students understand the relevance of economics. We tend to teach economics by concentrating on theoretical constructs. If we are not careful, students are left with the idea that there is nothing more to economics than graphs and equations representing theoretical, not real situations, and that as a consequence it has no significance to them. In many instances, they are not given the opportunity to test the hypotheses that they are required to learn--that is, rarely do they get to "*do*" economics. This requires an ability to identify an economic problem, select an appropriate method for analysis, conduct the analysis and then communicate the results to others. Only after students go through this process does economics become real to them, and this process is not possible at low levels of cognition.

Integrating students' human capital into economics courses designed to tap into higher levels of understanding has several appealing results. First, students learn and *retain* more economics. Second, new skills are developed while old skills are reinforced. Third, because the relevance of economics is more likely to be understood and appreciated, interest in economics increases and persists. The costs involved in this approach are minimal, if care is taken to utilize existing resources. The biggest costs are time, energy and creativity. Even these can be reduced if the institution provides meaningful rewards to faculty for time spent in these efforts.

An additional advantage of using methods that achieve these objectives is that benefits accrue to students regardless of their year in school, the level of the class or the their major. In fact, to wait until upper level courses, populated almost exclusively by economics majors defeats the purpose of the approach.

An Example of a Classroom Strategy

This section relates the author's experience with an active student participation approach over a school year, for four classes, two of which were principles of macroeconomics and two were intermediate macroeconomics. The following classroom strategy was developed for specific application to the students in the author's home institution, the University of Missouri-Rolla. The intent of explaining these techniques is only to offer an example, not to propose a solution to all instructors. Each of us needs to examine our needs, our available resources, and our goals to determine the most efficient methods that can be used.

The strategy used involved a four-step process. The first step was to engage the student in the process. The second step was to integrate writing and computers into assignments throughout the semester. The third was to use all assignments to develop interpersonal and critical thinking skills, and to provide opportunities for synthesis of material. The final step involved a three-part evaluation completed by students to measure the effectiveness of the techniques. Students were asked to evaluate the instructor, the techniques, and themselves.

The first step, *engaging the student*, gives them a sense of ownership and accountability. The goals, techniques and criteria to measure success were carefully explained at the beginning of the semester. For activities that were new to the students, practice assignments gave them the opportunity to raise questions and concerns. Throughout the semester, students were encouraged to provide feedback on their experiences.

A series of assignments were developed that *integrated writing and computers*. To integrate writing, weekly test essays were given in place of hour-long exams. Half of the weekly essays were used in team activities, and half were used to do peer evaluations. These activities are a simple modification of the traditional essay exam that require higher order thinking, and helps develop interpersonal skills and reasoning.

There were three primary categories of computer usage: electronic mail and the Internet, mainframe software applications, and DOS-based applications such as QuattroPro (QPRO) and WordPerfect. Electronic mail and the Internet became critical to the classes. Students from each class were subscribed to a distribution list. This enabled increased interaction among students, as well as quick dissemination of information from the instructor to students, including the test questions discussed earlier. In addition, an important source of information for the students were handouts transmitted through the e-mail distribution lists. Replacing the paper trail with electronic communication forced students to become regular users of electronic mail.

Third, assignments were given specifically to *encourage synthesis of material*. The most important assignment at both levels was a research paper, designed to synthesize the material learned throughout the semester, and required use of the DOS-based and mainframe applications. For instance, students were expected to conduct online library searches using the University of Missouri System online library catalog, Libraries of U-Mo Information Network (LUMIN). Principles level students performed data analysis using QPRO, and at the intermediate level, students used statistical software (SAS), available on the mainframe, for data analysis and for hypothesis testing.

As part of the research paper, students integrated a notebook on a selected topic, that was built during the semester, containing newspaper articles. Economic theory was then used to explain the articles. A discussion of relevant events was included in the paper, and one theoretical relationship was selected for empirical investigation. For instance, if a student had chosen unemployment as a topic, and the notebook contained several articles about investment, the paper might focus on how investment spending relates to unemployment. The theoretical relationship investigated might be the one between investment and interest rates, since interest rates are a determinant of investment spending. At the principles level, the paper had several additional requirements. Data had to be acquired electronically, and then QPRO (or any other spreadsheet program) was used to do some graphics and simple statistics. Using wordprocessing (WordPerfect was recommended[1]), a professional-quality paper was then prepared. Thus, DOS-based applications were the third category of computer usage. While at the principles level, QPRO was sufficient to investigate the investment-interest rate relationship (as in the example), at the intermediate level, this analysis was extended to include a statistical test of the hypothesis that such a relationship exists. In both cases, students were expected to use economic theory to draw conclusions from the data.

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[1] QPRO (a spreadsheet program) and WP are available on the Novell Network at UMR

Successful completion of this paper required several complex tasks--identification of a problem, an economic relationship, data acquisition, application of technology to the problem, analysis and conclusions. The advantage of this assignment is that, because so many skills are integrated to complete the paper (not the least of which is relating economic theory to the real world), students achieve a synthesis of those skills *and* economic concepts. Introducing computers into the economics classroom is not a new idea. There have been many attempts to do so, but this approach, because it uses existing resources, and provides students with a method to relate theory to the real world, improves on those attempts. Research on the benefits of previous computer applications to economics classes has been mixed (Soper, 1974; King and LaRoe, 1991). The biggest problem with integrating computers into existing classroom activities is the cost, which comprises not only the purchase price and maintenance of hardware and software, but also the perceived opportunity cost of the time devoted to computer usage that might be better spent teaching economics.

One way these issues have been addressed is through the development of text supplements, that are typically some kind of simulation program. They have the advantage of being inexpensive, and they typically give the student opportunities for repetitive exercises and tutorials (McNerty and Waits, 1982; and Millerd and Alastair, 1984). However, these have not met with much success (Walbert, 1989; and Porter and Riley, 1992). These computer programs are generally perceived as "appendages to a curriculum or a course in economics--optional but not integral, interesting but not important," (Sumansky, 1986).

The last step in the classroom strategy was a survey instrument that allowed students to *evaluate the instructor, the techniques, and themselves* at the end of the semester. The objectives of the strategies were restated (i.e., higher order learning and SCANS skills), and the students were asked whether each technique was helpful in achieving those goals, and whether they recommended the activity be continued. They were also asked to give recommendations for improvement. The results, which are summarized in Table 3, were overwhelmingly positive. Ninety-one percent found team activities helpful, and 96% favored their continued use. The percent in favor of peer evaluations was lower (82%), but many students reported persistent discomfort with 'criticizing' fellow students. Eighty percent of the students responding found electronic mail to be helpful in achieving the stated objectives of the course, and 87% of them recommended keeping it a part of the course. The most often cited positive attributes were: access to the instructor; and speed and ease of information transfer. Students generally expressed enthusiasm for the exposure to this technological resource, and several reported using e-mail for purposes unrelated to the course. The notebook assignment got the lowest mark in terms of its perceived helpfulness. Students reported that while they appreciated the continuous feedback from the instructor, since it was not graded, they had trouble motivating themselves to do it. However, they seemed to appreciate the need for the assignment, as 78% of them recommended that it be used in future classes. The positive response for the research paper was high (84%). It was by far the most complex of all activities, and required the highest level of integration and synthesis, yet 84% of them found it helpful, and 84% suggested it be continued. The responses alluded to the opportunity to put all that had been learned to use, and the solidifying of concepts. The objectives of the paper were achieved, since students viewed the project as a way to combine all the analytical pieces into the larger context of the macroeconomy. Several also commented that they now examine economic events in a more objective and critical manner (Manning, 1993). Even students who were initially reluctant to use the computer recommended that the activities be continued.

These evaluation results do not address the critical question of whether these students have learned and retained more economics, or learned to transfer knowledge from one course to another, or whether they will be more successful in the workplace. There has, however, been increased interest in economics among non-majors evidenced in part by an increase in the number of economics minors in the past two years. Appreciation for economics is also on the rise. We have a very popular student economics conference. The majority of students presenting papers are engineering and science majors who apply economic theory to a problem in their discipline.

Conclusions

The problems facing the educational system is not likely to improve in the future. More creative solutions will need to be found. This paper discusses one possible solution to the problem of segmented teaching approaches across all disciplines. It is an integrated approach, focused on the use of existing resources. Writing- and computer-intensive assignments that apply active student participation techniques foster cognitive achievement in economics and give students the opportunity to develop and practice skills necessary for success in the workplace.

The strategies outlined here can still be expanded and developed. For instance, the information resources available on the Internet are tremendous. It will also be important to develop an effective, multi-faceted evaluation design to make sure that students are achieving objectives.

FOOTNOTES

1. QPro (a spreadsheet program) and WordPerfect are available on the Novell Network at UMR.

References

Bloom, B. S., M.D. Englehart, E. J. Furst, W. H. Hill and D.R. Krathwohl, 1956. *Taxonomy of Educational Objectives Handbook I: Cognitive Domain.* New York: David McKay.

King, P. G. and R. M. LaRoe, 1991. "The Laboratory-Based Economics Curriculum," *Journal of Economic Education.* Vol. 6, No. 4. 4-28.

Manning, L. M., 1993. "Teaching More than Economics to Engineers." *ASEE Proceedings* April, 1993.

Millerd, F. W. and A. R. Alastair, 1987. "Computer Simulations as an Integral Part of Intermediate Macroeconomics." *Journal of Economic Education.* Vol. 18, No. 3. 269-286.

Porter, T. A. and T. M. Riley, 1992. "CAI in Economics: What Happened to the Revolution?" *Journal of Economic Education.* Vol. 23, No. 4. 374-379.

Saunders, P. and W. B. Walstad, editors, 1990, *The Principles of Economics Course: A Handbook for Instructors.* New York: McGraw Hill.

Soper, J. C., 1974. "Computer-Assisted Instruction in Economics: A Survey," *Journal of Economic Education.* Vol. 6., No. 4, 4-28.

Sumansky, John. "College Economics and the Computer Revolution." *Social Science Microcomputer Review*, Vol. 4, No. 4. Winter, 1986. 480-486.

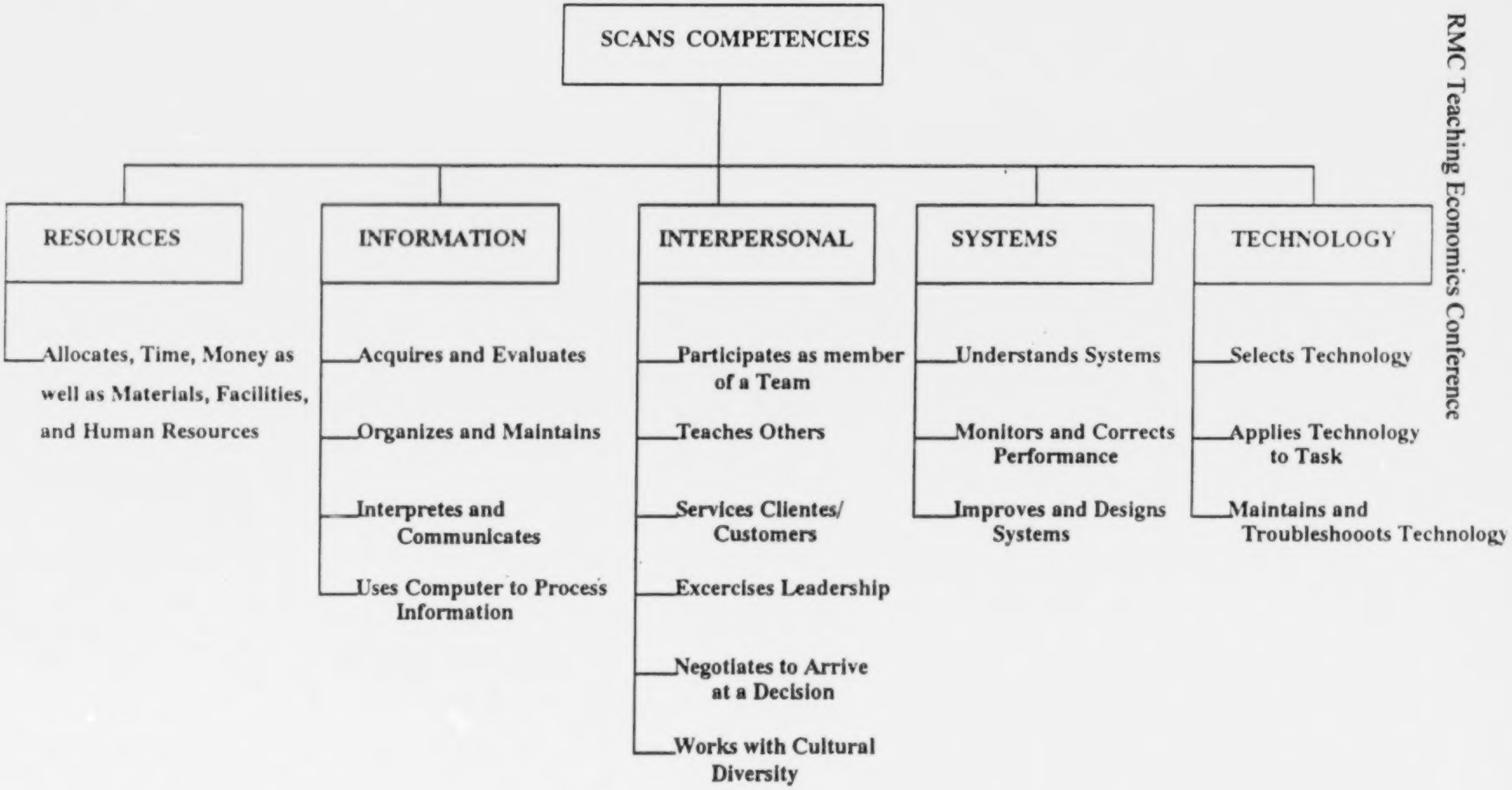
Yoho, D. L. and W. B. Walstad. 1990. "Microcomputer Software for Principles of Economics Courses," in P. Saunders and W. B. Walsted (eds.) *The Principles of Economics Course: A Handout for Instructors*, (169-179). New York: McGraw-Hill.

SCANS FOUNDATION SKILLS

- BASIC SKILLS
  - Reading
  - Writing
  - Arithmetic
  - Mathematics
  - Listening
  - Speaking
- THINKING SKILLS
  - Creative Thinking
  - Decision Making
  - Problem Solving
  - Seeing Things in the Mind's Eye
  - Knowing How to Learn
  - Reasoning
- PERSONAL QUALITIES
  - Responsibility
  - Self-Esteem
  - Social
  - Self-Management
  - Integrity/Honesty

Source: Secretary's Commission on Achieving Necessary Skills, Skills and Tasks for Jobs: A SCANS Report for America 2000, U.S. Department of Labor: WAshington, D.C..

Table 1


SCANS COMPETENCIES
RESOURCES
Allocates, Time, Money as well as Materials, Facilities, and Human Resources
INFORMATION
Acquires and Evaluates
Organizes and Maintains
Interpretes and Communicates
Uses Computer to Process Information
INTERPERSONAL
Participates as member of a Team
Teaches Others
Services Clientes/ Customers
Excercises Leadership
Negotiates to Arrive at a Decision
Works with Cultural Diversity
SYSTEMS
Understands Systems
Monitors and Corrects Performance
Improves and Designs Systems
TECHNOLOGY
Selects Technology
Applies Technology to Task
Maintains and Troubleshooots Technology

Source: Secretary's Commission on Achieving Necessary Skills, Skills and Tasks for Jobs: A SCANS Report for America 2000, U.S. Department of Labor: WAshington, D.C..

Table 2

Table 3: Student Responses in Evaluation of Computer- and Writing-Intensive Activities

	Helpful?			Recommended for Continued Use?		
	Yes	No	Don't Know	Yes	No	Don't Know
Team Activities	91%	7%	2%	96%	2%	2%
Peer Evaluation	82	9	9	82	7	11
Electronic Mail	80	18	2	87	11	2
Notebook	69	13	18	78	7	16
Final Paper	84	11	4	84	9	7

Note: All activities required computer usage except the notebook

Selected Uses of Personal Computers in Teaching Economics

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Introduction

It is a well-known fact among economists that one of the reasons for lower productivity in the service sectors compared to manufacturing and farming is that possibilities for capitallabor substitution in the former are much more limited than in the latter.

However, in recent years computer hardware and software have served as the main forms of capital goods which have helped increase labor productivity in managerial, administrative and office-work activities, demonstrating that the potential for capital-labor substitution in the services sector is also quite significant. In contrast to the period 1960-1970 during which computers were applied primarily for clerical functions, during the subsequent period they are being used increasingly for analytical work by scientists, educators and managers who rely on sophisticated softwares to attain higher productivity in performing complex tasks. Many observers have noted that whereas Industrial Revolution provided opportunities for capital-labor substitution primarily for manual labor, the ongoing Information Revolution is extending such opportunities to include "mental labor" as well.

As a tool a software may be considered as an extension of the "mental organs" of the user in the same sense as physical tools may be viewed as functional extensions of the muscular and skeletal facilities of the user (Lotka 1 956). A software provides increased productivity because it, like any other species of concrete capital, constitutes a method of "round-about production" in the Bohm-Bawerkian sense (Blaug, 1 962, pp. 450 f.).

Capital-Labor Substitution in Teaching: Quality or Quantity?

The use of PC's in teaching and learning at the college level has spread rather slowly, hardly commensurate with its importance as a revolutionary teaching and learning tool. Indeed the prevailing views about the various ways in which the modern electronic technologies should be applied in education are quite diverse. Some administrators seem to be primarily interested in computers as possible cost-reducing devices in relation to some of the teaching functions, hoping that the reduction in cost may be achieved without significant drop in the quality of instruction.

On the other hand, teachers with experience in the use of computers emphasize the importance of PC's as a tool for increasing the quality of the teaching-learning experience. They see PC's as a device for supplementing (rather than supplanting) the traditional teaching tools and methods. This view sees in the PC's an opportunity for interactive teaching-learning between the instructor and his students, thus making the process more, not less, personal, as it would be the case with such technologies as interactive telecasting for distant learning.

Spreadsheet as a Modeling Tool

Spreadsheet is of great interest to economists because, among other things, it may be used for tabulating mathematical functions and their partial derivatives; for finding solutions to mathematical equations arising out of free or constrained optimization problems; and for formulating and solving multiple-constraint linear programming problems.
Spreadsheet is at the same time abstract -- as a model ought to be -- and concrete. The very process of setting up a spreadsheet consists of an explicit and exact articulation of the economic model. This activity by itself forces the student to acquire an understanding of the abstract model structure, and of the nature of modeling activity in general. In particular, the devices of absolute and relative reference in spreadsheet provides a very effective way to bring out the distinction between the variables and parameters of a model, because cells and columns of numbers take the place of mathematical symbols and yet the abstract nature of the process is preserved fully.

Once the formulation of each part of the model is completed the associated marginal measure -- the partial derivative functions -- are calculated and charted to provide visual representation of the model's properties. Changing the parameters in this stage provides deeper familiarity with the model and also prepares the necessary step for comparative static analysis at a later stage when the model is completed and the equilibrium condition is defined.

Comparative static analysis of the model consists of running the complete model for alternative values of parameters and observing how the equilibrium values change as a result of changes in the parameters. The use of spreadsheets reduces such analysis to an inductive activity through which the student discovers various properties of the model. He tends to develop gradually more abstract understanding of the model on the basis of concrete manipulation and experimentation with it. All this is reinforced by the graphic facilitates provided by the spreadsheet.

The problem data can be described in one spreadsheet in great detail and linked with other spreadsheets that describe various economic models which use the said data. Then a change in any part of the data is automatically reflected in all the models that use the data. For example fixed cost may be described in terms of half a dozen of its usual determinants such insurance, interest rate, etc. A change in any of these determinants will automatically trigger recalculation and regraphing of all the models that are linked with the data spreadsheet. This provides a great pedagogical facility, because by the time, say, the marginal and average cost curves are derived the student is too overburdened to be able to trace the effect of input prices, wage rates or any of the determinants of fixed cost on the model he has worked so hard to develop. Spreadsheet has all of these explicitly recorded. He can now start 'playing" with the model and drill his concepts on the basis of a rich variety of inductive exercises.

A student who once goes through the exercise of building the spreadsheets required for a microeconomics course will have undertaken an investment which will constitute a permanent possession, and which he can continue to develop in many different directions. It is virtually impossible for such a student to fail to develop a deep understand of microeconomics, because he would have had to construct the said spreadsheets on the basis of full understanding of the roles of data, variables, and structural relationships of the model.

Economics Majors versus Non-Majors

Spreadsheets can serve as an effective substitute -- and indeed a superior alternative -- for calculus in intermediate economics, *for some students,* though by no means for all.

Students who major in economics, specially those intending to attend graduate studies in this area, cannot rely on spreadsheets as an alternative for mathematical training. For them it can serve as an exploratory tool that can *supplement* their work in mathematics, helping them attain a deeper understanding of the mathematical methods in economics, and to attain maturity in the field more rapidly.

However, the non-majors, say, those in marketing or finance, for whom knowledge of some parts of economics is indispensable, and who typically have minimal mathematical background, can use spreadsheets as a *substitute* for the mathematical treatment. Through its use they can grasp the subtleties of economic models quite effectively, and with relative ease, notwithstanding their insufficient background in mathematics.

Purpose, Scope and Objectives

This paper provides a framework for conducting a hands-on workshop on selected uses of personal computers for economics instruction. It aims at serving economics instructors who have very little or no background in the use of PC's for economics instruction and analysis. It focuses on the use of spreadsheets, charts and graphs in the formulation and analysis of selected economic models. Outlining, word-processing and equation editor will be discussed briefly also.

Aside from the above purpose the paper may also be of interest to economists who already have some experience in working with the various general-function softwares for personal computers. Spreadsheets are used to model, graph and analyze demand, marginal and total revenue, elasticity, various average and total cost curves, and the Cobb-Douglas function. Although the models used for discussion are all from microeconomics, the participants will be able to transfer their knowledge attained to macroeconomic models without any difficulties.

The specific objectives of the workshop are as follows:
1. To provide hands-on experience with some important uses of PC's for teaching economics.
2. To demonstrate that the use of PC's by the professors and the students can make a substantial improvement in the process of teaching and learning economics.
3. To provide indications as to the minimum requirement for effective use of PC's in the classroom, and as to the direction to be taken for going beyond the minimum.
4. To emphasize that the computer packages which come with some textbooks, although "better than nothing", are best avoided, because they constitute a very poor substitute for the active use of PC's through spreadsheet and other software. The latter makes it possible to focus on the logic of model development and analysis as opposed to the manipulation of a model already formulated by some one else, with all kinds of implicit assumptions.
5. To show that absolutely everyone can start using PC's, regardless of how "computer illiterate" he/she may be or how much "computer phobia" he/she may have experienced in the past.

6. To provide some guidelines about how to choose a set of softwares that would take into account cost, mutual compatibility, and long-term supportability and other benefits.

Method

My presentation will be interactive, involving the participants in hands-on activities and continuous feedback through informal conversation. From the very start each participant will generate a document which will be continuously modified and developed through a series of activities, finally evolving into an integrated document with text, equations, graphs and tables, which may be printed.

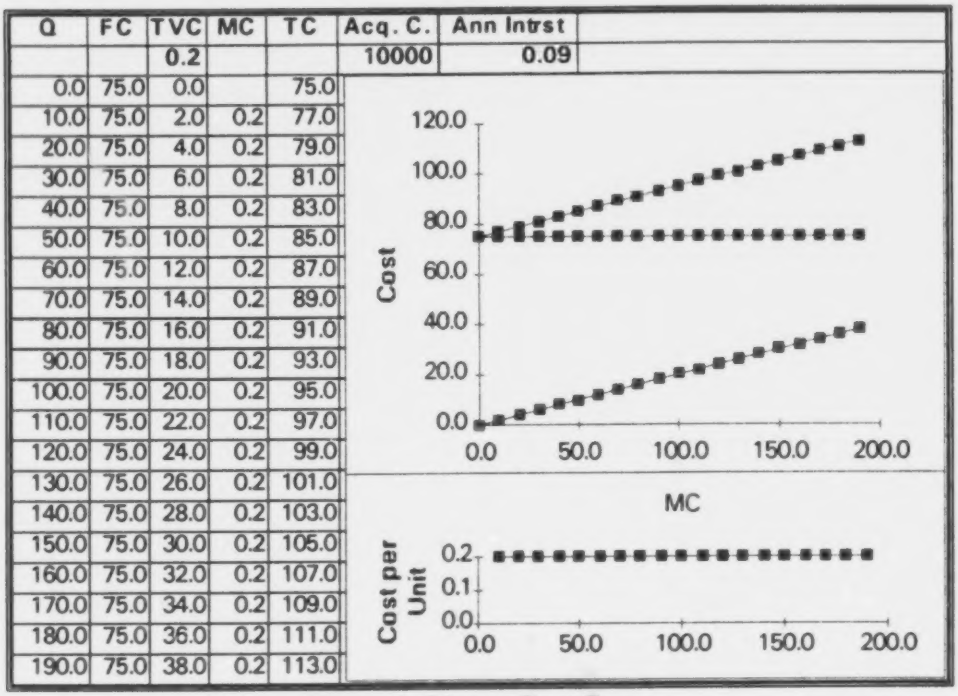
I will be using a laptop computer and an LCD panel together with a regular projector to project the content of the computer screen on the projection screen. Each two participants will be sharing a computer, and I will ask each pair to follow my instructions in working through a number of examples from the major areas of microeconomics, emphasizing the importance of spreadsheets as a modeling tool which forces the student to focus on the logic of each model.

Spreadsheets and Graphs for Economic Analysis

In the following exercises spreadsheets are used to model the traditional cost treatment in microeconomics, starting from simplest possible assumptions, and gradually introducing more complex cases.

Cost

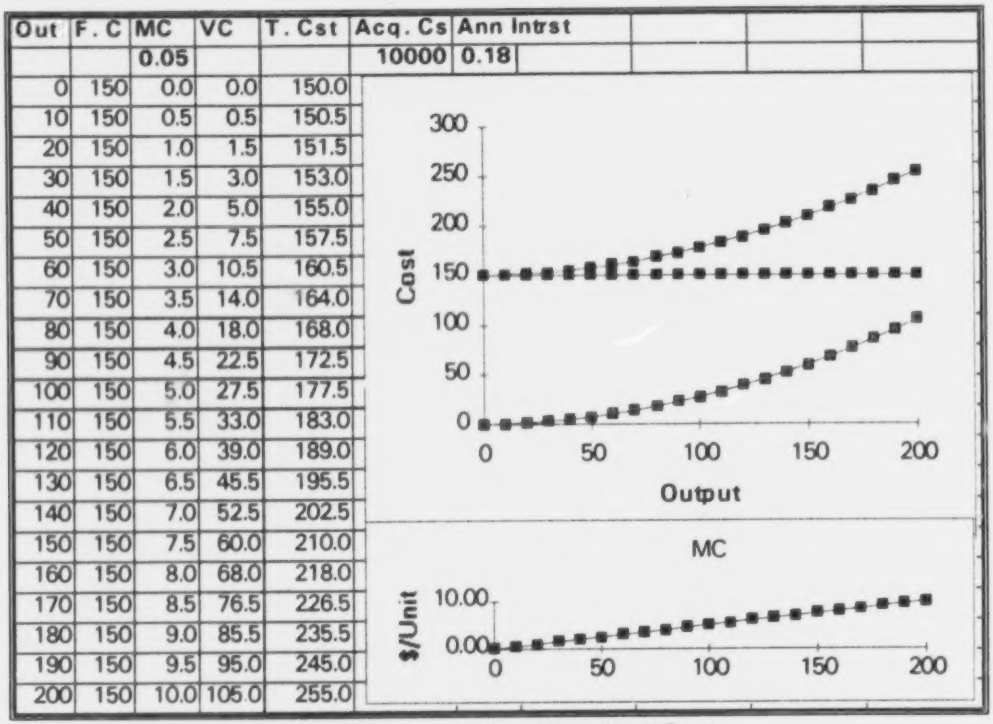
The spreadsheet in Figure 1 assumes a linear cost curve. The data and their descriptions appear in the first two rows. This exercise introduces the basic spreadsheet and graphing operations and how they facilitate the study of changes in the data of the model on its graphical representation. In the example used it is assumed that depreciation is negligible and marginal cost is constant. The only fixed cost is assumed to be the cost of capital.



Q	FC	TVC	MC	TC	Acq. C.	Ann Intrst
		0.2			10000	0.09
0.0	75.0	0.0		75.0		
10.0	75.0	2.0	0.2	77.0		
20.0	75.0	4.0	0.2	79.0		
30.0	75.0	6.0	0.2	81.0		
40.0	75.0	8.0	0.2	83.0		
50.0	75.0	10.0	0.2	85.0		
60.0	75.0	12.0	0.2	87.0		
70.0	75.0	14.0	0.2	89.0		
80.0	75.0	16.0	0.2	91.0		
90.0	75.0	18.0	0.2	93.0		
100.0	75.0	20.0	0.2	95.0		
110.0	75.0	22.0	0.2	97.0		
120.0	75.0	24.0	0.2	99.0		
130.0	75.0	26.0	0.2	101.0		
140.0	75.0	28.0	0.2	103.0		
150.0	75.0	30.0	0.2	105.0		
160.0	75.0	32.0	0.2	107.0		
170.0	75.0	34.0	0.2	109.0		
180.0	75.0	36.0	0.2	111.0		
190.0	75.0	38.0	0.2	113.0		

Figure 1. Linear Cost Curve

In Figure 2 marginal cost is assumed to increase with the level of output.



Out	F. C	MC	VC	T. Cst	Acq. Cs	Ann Intrst
		0.05			10000	0.18
0	150	0.0	0.0	150.0		
10	150	0.5	0.5	150.5		
20	150	1.0	1.5	151.5		
30	150	1.5	3.0	153.0		
40	150	2.0	5.0	155.0		
50	150	2.5	7.5	157.5		
60	150	3.0	10.5	160.5		
70	150	3.5	14.0	164.0		
80	150	4.0	18.0	168.0		
90	150	4.5	22.5	172.5		
100	150	5.0	27.5	177.5		
110	150	5.5	33.0	183.0		
120	150	6.0	39.0	189.0		
130	150	6.5	45.5	195.5		
140	150	7.0	52.5	202.5		
150	150	7.5	60.0	210.0		
160	150	8.0	68.0	218.0		
170	150	8.5	76.5	226.5		
180	150	9.0	85.5	235.5		
190	150	9.5	95.0	245.0		
200	150	10.0	105.0	255.0		

Figure 2. Increasing Marginal Cost.

In the next spreadsheet in Figure 3 a U-shaped marginal cost curve is assumed and the total cost curves are drawn. The formula for defining marginal cost appears at the top of the spreadsheet.

Q	FC	MC	VC	TC	Acq. C,	Intrst
	100	0.02			15000	0.06
0	75		0.0	75.0		
2	75	50.1	50.1	125.1		
4	75	25.3	75.4	150.4		
6	75	17.4	92.8	167.8		
8	75	13.8	106.6	181.6		
10	75	12.0	118.6	193.6		
12	75	11.2	129.8	204.8		
14	75	11.1	140.8	215.8		
16	75	11.4	152.2	227.2		
18	75	12.0	164.2	239.2		
20	75	13.0	177.2	252.2		
22	75	14.2	191.5	266.5		
24	75	15.7	207.2	282.2		
26	75	17.4	224.5	299.5		
28	75	19.3	243.8	318.8		
30	75	21.3	265.1	340.1		
32	75	23.6	288.7	363.7		
34	75	26.1	314.8	389.8		
36	75	28.7	343.5	418.5		
38	75	31.5	375.0	450.0		
40	75	34.5	409.5	484.5		

$$MC = aQ^2 + \frac{b}{Q}$$

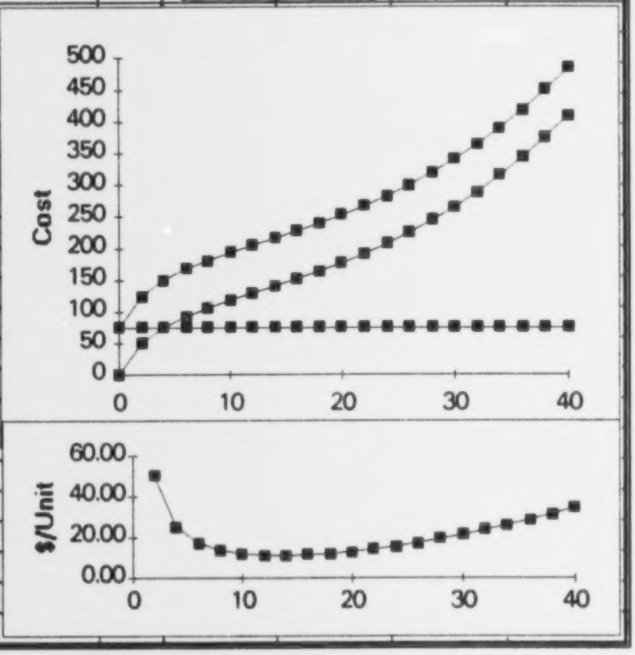
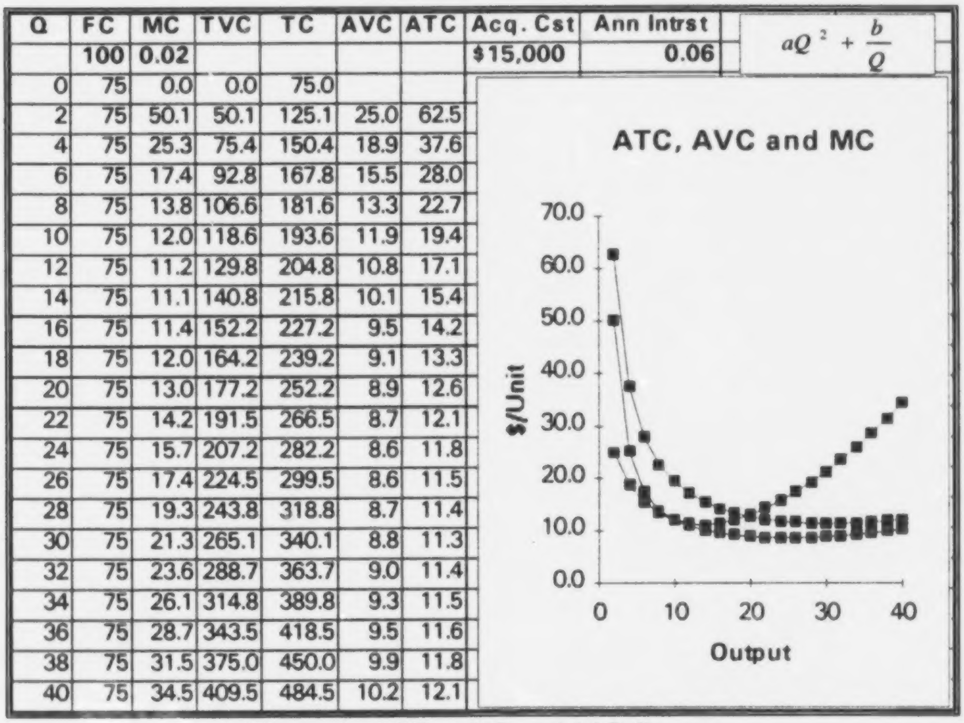


Figure 3. U-Shaped Marginal Cost

The data from the preceding spreadsheet are used to calculate and graph the marginal cost and the average cost curves in Figure 4.



Q	FC	MC	TVC	TC	AVC	ATC	Acq. Cst	Ann Intrst	$aQ^2 + \frac{b}{Q}$
	100	0.02					$15,000	0.06	
0	75	0.0	0.0	75.0					
2	75	50.1	50.1	125.1	25.0	62.5			
4	75	25.3	75.4	150.4	18.9	37.6			
6	75	17.4	92.8	167.8	15.5	28.0			
8	75	13.8	106.6	181.6	13.3	22.7			
10	75	12.0	118.6	193.6	11.9	19.4			
12	75	11.2	129.8	204.8	10.8	17.1			
14	75	11.1	140.8	215.8	10.1	15.4			
16	75	11.4	152.2	227.2	9.5	14.2			
18	75	12.0	164.2	239.2	9.1	13.3			
20	75	13.0	177.2	252.2	8.9	12.6			
22	75	14.2	191.5	266.5	8.7	12.1			
24	75	15.7	207.2	282.2	8.6	11.8			
26	75	17.4	224.5	299.5	8.6	11.5			
28	75	19.3	243.8	318.8	8.7	11.4			
30	75	21.3	265.1	340.1	8.8	11.3			
32	75	23.6	288.7	363.7	9.0	11.4			
34	75	26.1	314.8	389.8	9.3	11.5			
36	75	28.7	343.5	418.5	9.5	11.6			
38	75	31.5	375.0	450.0	9.9	11.8			
40	75	34.5	409.5	484.5	10.2	12.1			

Figure 4. ATC, AVC and MC Curves

Revenue

The demand data in Figure 5 are used as the basis for the total revenue diagram in the next few spreadsheet.

Qnt	Pr	a	b	Max P	Pr Vartn
		100	-20	5	0.25
0	5.00				
5	4.75				
10	4.50				
15	4.25				
20	4.00				
25	3.75				
30	3.50				
35	3.25				
40	3.00				
45	2.75				
50	2.50				
55	2.25				
60	2.00				
65	1.75				
70	1.50				
75	1.25				
80	1.00				
85	0.75				
90	0.50				
95	0.25				
100	0.00				

$Q = a + bP$

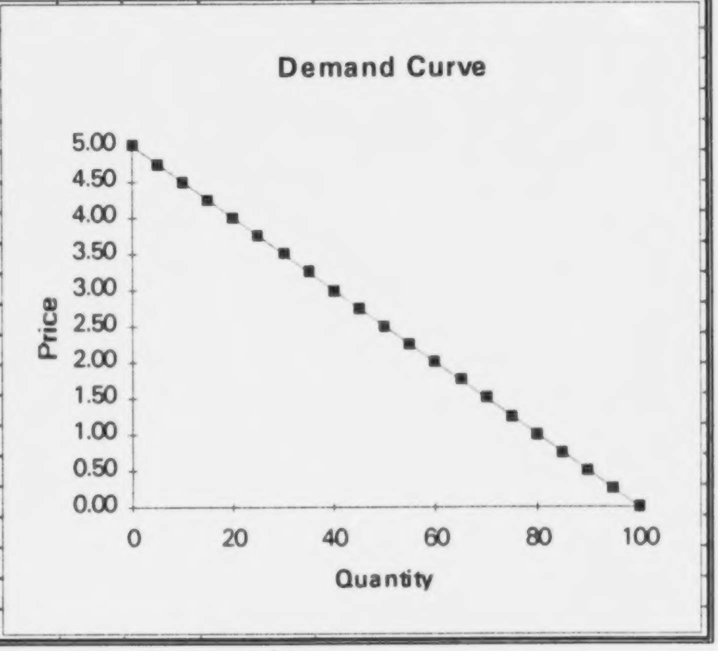
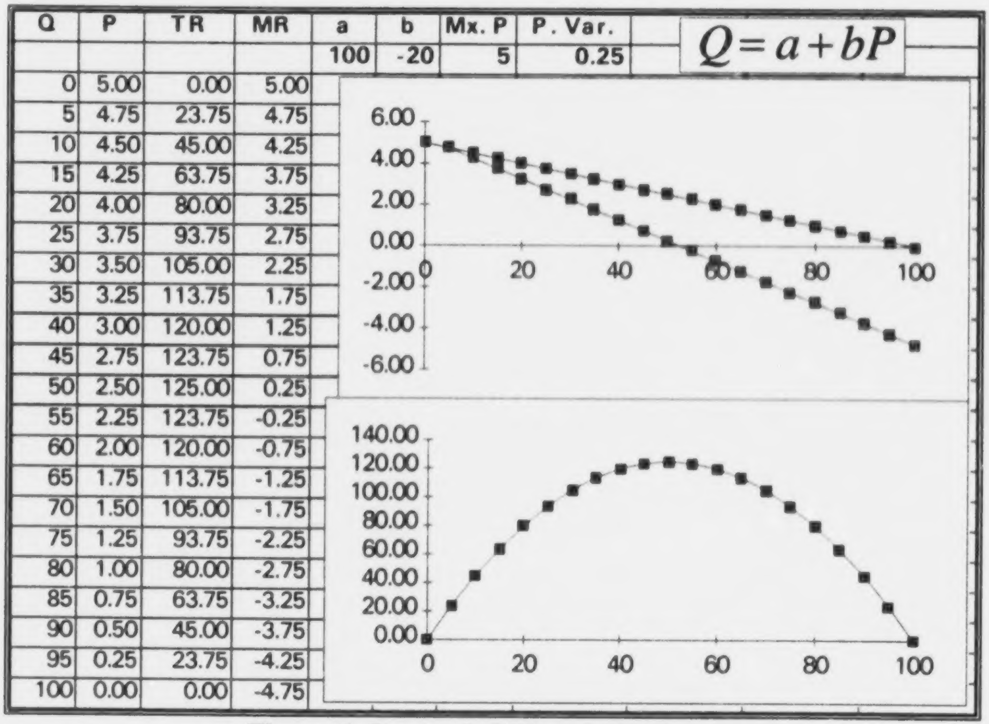


Figure 5. Demand Data and Graph

The spreadsheet in Figure 6 derives MR and TR curves on the basis of the same data as the preceding spreadsheet in Figure 5.

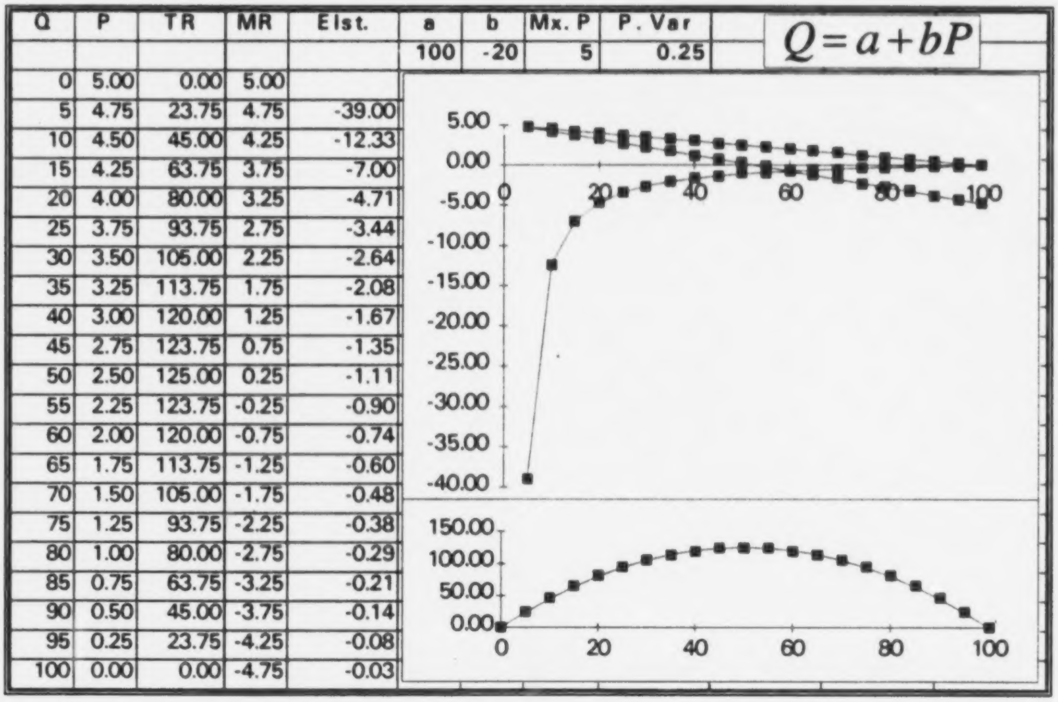


$Q = a + bP$

Q	P	TR	MR	a	b	Mx. P	P. Var.
				100	-20	5	0.25
0	5.00	0.00	5.00				
5	4.75	23.75	4.75				
10	4.50	45.00	4.25				
15	4.25	63.75	3.75				
20	4.00	80.00	3.25				
25	3.75	93.75	2.75				
30	3.50	105.00	2.25				
35	3.25	113.75	1.75				
40	3.00	120.00	1.25				
45	2.75	123.75	0.75				
50	2.50	125.00	0.25				
55	2.25	123.75	-0.25				
60	2.00	120.00	-0.75				
65	1.75	113.75	-1.25				
70	1.50	105.00	-1.75				
75	1.25	93.75	-2.25				
80	1.00	80.00	-2.75				
85	0.75	63.75	-3.25				
90	0.50	45.00	-3.75				
95	0.25	23.75	-4.25				
100	0.00	0.00	-4.75				

Figure 6. Demand, MR and TR Curves

The spreadsheet in Figure 7 calculates and graphs price elasticity at various quantities of output demanded. Strictly speaking the "elasticity curve should be given a different axis because its units are different from those of price and MR, but for simplicity the same axis is used for all three measures.



Q	P	TR	MR	Elst.	a	b	Mx. P	P. Var
					100	-20	5	0.25
0	5.00	0.00	5.00					
5	4.75	23.75	4.75	-39.00				
10	4.50	45.00	4.25	-12.33				
15	4.25	63.75	3.75	-7.00				
20	4.00	80.00	3.25	-4.71				
25	3.75	93.75	2.75	-3.44				
30	3.50	105.00	2.25	-2.64				
35	3.25	113.75	1.75	-2.08				
40	3.00	120.00	1.25	-1.67				
45	2.75	123.75	0.75	-1.35				
50	2.50	125.00	0.25	-1.11				
55	2.25	123.75	-0.25	-0.90				
60	2.00	120.00	-0.75	-0.74				
65	1.75	113.75	-1.25	-0.60				
70	1.50	105.00	-1.75	-0.48				
75	1.25	93.75	-2.25	-0.38				
80	1.00	80.00	-2.75	-0.29				
85	0.75	63.75	-3.25	-0.21				
90	0.50	45.00	-3.75	-0.14				
95	0.25	23.75	-4.25	-0.08				
100	0.00	0.00	-4.75	-0.03				

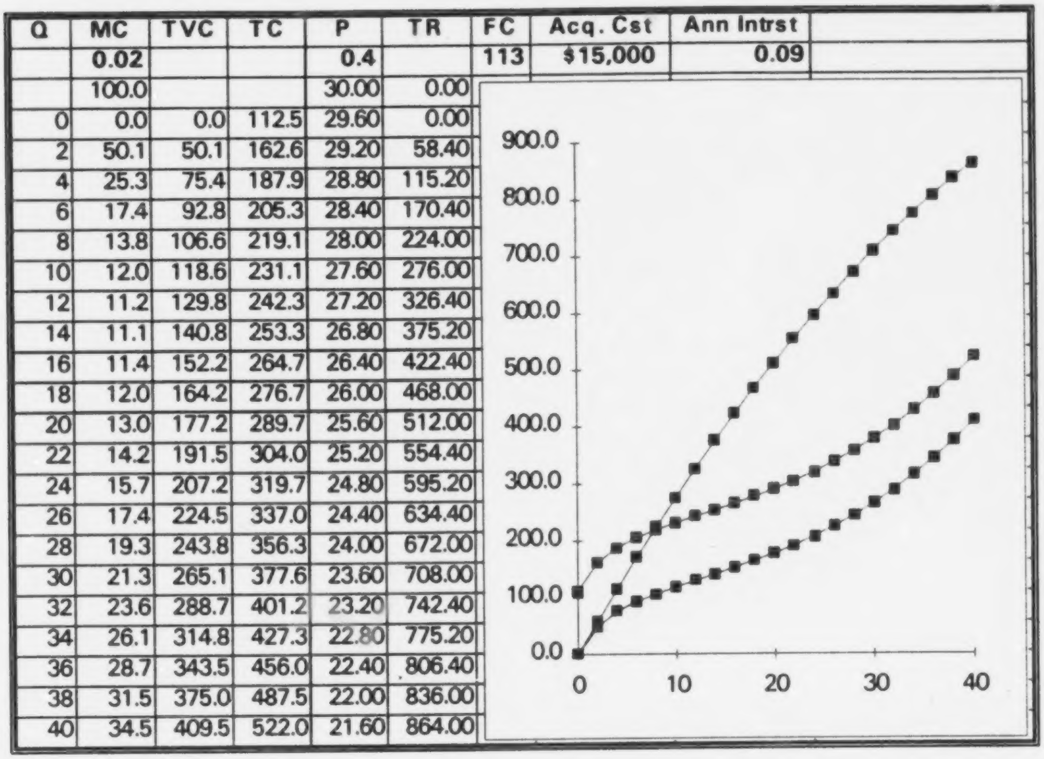
$$Q=a+bP$$

5.00
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
-30.00
-35.00
-40.00
0
20
40
60
80
100
150.00
100.00
50.00
0.00
0
20
40
60
80
100

Figure 7. "Elasticity Curve" Compared with Demand, MR and TR curves.

Cost and Revenue

The spreadsheet in Figure 8 combines TR, TVC and TC from the preceding spreadsheets.



Q	MC	TVC	TC	P	TR	FC	Acq. Cst	Ann Intrst
	0.02			0.4		113	$15,000	0.09
	100.0			30.00	0.00			
0	0.0	0.0	112.5	29.60	0.00			
2	50.1	50.1	162.6	29.20	58.40			
4	25.3	75.4	187.9	28.80	115.20			
6	17.4	92.8	205.3	28.40	170.40			
8	13.8	106.6	219.1	28.00	224.00			
10	12.0	118.6	231.1	27.60	276.00			
12	11.2	129.8	242.3	27.20	326.40			
14	11.1	140.8	253.3	26.80	375.20			
16	11.4	152.2	264.7	26.40	422.40			
18	12.0	164.2	276.7	26.00	468.00			
20	13.0	177.2	289.7	25.60	512.00			
22	14.2	191.5	304.0	25.20	554.40			
24	15.7	207.2	319.7	24.80	595.20			
26	17.4	224.5	337.0	24.40	634.40			
28	19.3	243.8	356.3	24.00	672.00			
30	21.3	265.1	377.6	23.60	708.00			
32	23.6	288.7	401.2	23.20	742.40			
34	26.1	314.8	427.3	22.80	775.20			
36	28.7	343.5	456.0	22.40	806.40			
38	31.5	375.0	487.5	22.00	836.00			
40	34.5	409.5	522.0	21.60	864.00			

Figure 8. TR, TVC and TC Curves.

The spreadsheet in Figure 9 combines demand, MR, MC, AVC and ATC in one diagram, using the data from the preceding spreadsheets.

Q	MC	ATC	AVC	Pr	MR	TR	TVC	TC	FC	Acq. Cst	Ann Intrst
	0.02			0.4					113	15000	0.09
	100.0			40		0.00					
0				39.60		0.00	0.0	112.5			
2	50.1	81.3	25.0	39.20	39.20	78.40	50.1	162.6			
4	25.3	47.0	18.9	38.80	38.40	155.20	75.4	187.9			
6	17.4	34.2	15.5	38.40	37.60	230.40	92.8	205.3			
8	13.8	27.4	13.3	38.00	36.80	304.00	106.6	219.1			
10	12.0	23.1	11.9	37.60	36.00	376.00	118.6	231.1			
12	11.2	20.2	10.8	37.20	35.20	446.40	129.8	242.3			
14	11.1	18.1	10.1	36.80	34.40	515.20	140.8	253.3			
16	11.4	16.5	9.5	36.40	33.60	582.40	152.2	264.7			
18	12.0	15.4	9.1	36.00	32.80	648.00	164.2	276.7			
20	13.0	14.5	8.9	35.60	32.00	712.00	177.2	289.7			
22	14.2	13.8	8.7	35.20	31.20	774.40	191.5	304.0			
24	15.7	13.3	8.6	34.80	30.40	835.20	207.2	319.7			
26	17.4	13.0	8.6	34.40	29.60	894.40	224.5	337.0			
28	19.3	12.7	8.7	34.00	28.80	952.00	243.8	356.3			
30	21.3	12.6	8.8	33.60	28.00	1008.00	265.1	377.6			
32	23.6	12.5	9.0	33.20	27.20	1062.40	288.7	401.2			
34	26.1	12.6	9.3	32.80	26.40	1115.20	314.8	427.3			
36	28.7	12.7	9.5	32.40	25.60	1166.40	343.5	456.0			
38	31.5	12.8	9.9	32.00	24.80	1216.00	375.0	487.5			
40	34.5	13.0	10.2	31.60	24.00	1264.00	409.5	522.0			

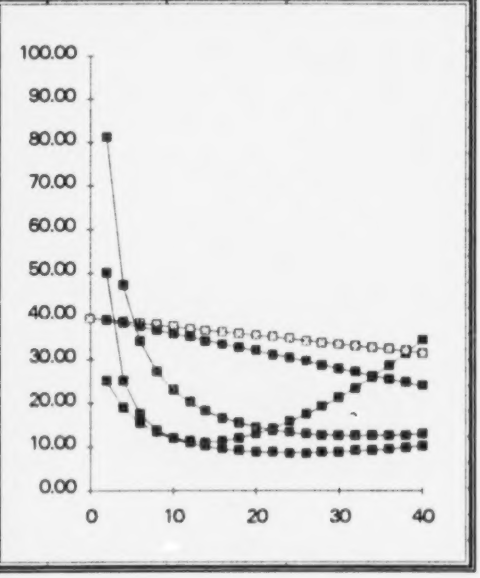
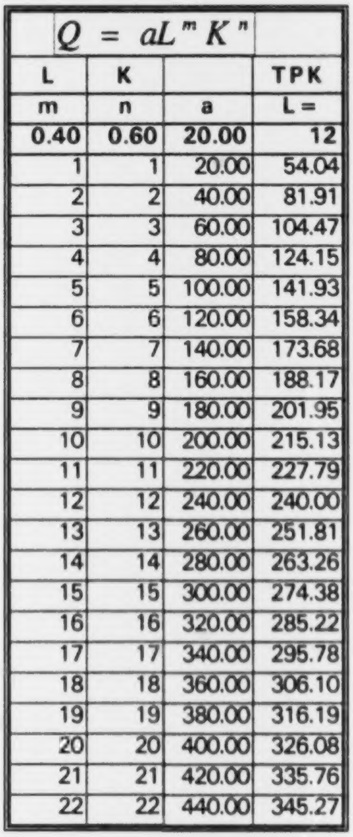


Figure 9. Demand, MR, MC, AVC and ATC Curves

A useful way of using the above spreadsheets for instructional purposes would be to tabulate the details of the data in a separate (data) spreadsheet and to link all the spreadsheets to the latter. For example fixed cost depends on insurance, administrative salaries, cost of capital, etc. When any of these components changes the fixed cost calculated in the data spreadsheet changes and all other spreadsheets are correspondingly adjusted. The same treatment may be applied to variable cost and to demand. But this exercise will take us beyond the purpose in view in the present work.

Cobb-Douglas Function

Spreadsheets make working with the Cobb-Douglas function very easy as seen in the next two exercises displayed in Figures 10 and 11.



$Q = aL^m K^n$			
L	**K**		**TPK**
m	n	a	L=
0.40	**0.60**	**20.00**	**12**
1	1	20.00	54.04
2	2	40.00	81.91
3	3	60.00	104.47
4	4	80.00	124.15
5	5	100.00	141.93
6	6	120.00	158.34
7	7	140.00	173.68
8	8	160.00	188.17
9	9	180.00	201.95
10	10	200.00	215.13
11	11	220.00	227.79
12	12	240.00	240.00
13	13	260.00	251.81
14	14	280.00	263.26
15	15	300.00	274.38
16	16	320.00	285.22
17	17	340.00	295.78
18	18	360.00	306.10
19	19	380.00	316.19
20	20	400.00	326.08
21	21	420.00	335.76
22	22	440.00	345.27

Figure 10. Tabulation of Cobb-Douglas Function

Figure 11 shows the total and marginal products of capital for L = 12.

L	K		TPK	MPL
m	n	a	L =	
0.3	**0.6**	**20.00**	**12**	
1.0	1.0	20.00	42.15	
2.0	2.0	37.32	63.89	21.74
3.0	3.0	53.76	81.48	17.60
4.0	4.0	69.64	96.83	15.35
5.0	5.0	85.13	110.70	13.87
6.0	6.0	100.32	123.50	12.80
7.0	7.0	115.24	135.47	11.97
8.0	8.0	129.96	146.77	11.30
9.0	9.0	144.49	157.52	10.75
10.0	10.0	158.87	167.80	10.28
11.0	11.0	173.09	177.67	9.88
12.0	12.0	187.19	187.19	9.52
13.0	13.0	201.18	196.40	9.21
14.0	14.0	215.05	205.33	8.93
15.0	15.0	228.83	214.01	8.68
16.0	16.0	242.51	222.46	8.45
17.0	17.0	256.11	230.70	8.24
18.0	18.0	269.63	238.75	8.05
19.0	19.0	283.08	246.62	7.87
20.0	20.0	296.45	254.33	7.71

$$Q = a L^m K^n$$

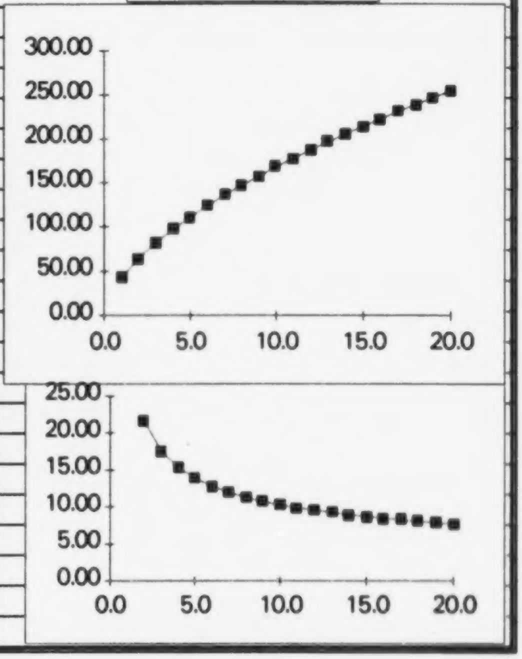


Figure 11. Graphs of Total and Marginal Product Curves of Capital

Appendix I

Background of Participants and Facilities Needed

No background other than familiarity with the computer keyboard and some typing ability is assumed.

For the required facilities two plans may be suggested for differing budgetary resources:

- Option 1. Minimum Plan: One computer for each group of 4 to 6 workshop participants.
- Option 2. Ideal facilities: One computer for each pair of participants.
- One or more printers (preferably LaserJet) to be used jointly by the participants.
- Hardware: A 386 or higher Computer with 40 or more MB HD, one floppy disk drive and 4 to 8 MB of RAM; Monitor, Keyboard, Mouse
- Projector: A regular 3M overhead projector and a projector screen.
- Software: Option 1. Minimum facilities: Microsoft Word, and Excel, Paintbrush.

Option 2. Ideal facilities: Microsoft Word, Excel, Powerpoint and Access.Alternatively: Microsoft Office (the professional version) and Project.

Appendix II

Investment in Computer Hardware and Software

Institutions which want to persuade their faculty to use PC's in their teaching activities should take note of the following: Increasing capital/labor ratio for enhancing faculty productivity at the classroom level should be viewed as a deliberate act of strategic investment not a haphazard activity of marginal interest, as is usually the case in many institutions. A few remarks may be made within the scope of the present discussion:

Effective use of PC's in the classroom requires that:

Classrooms have at least 1 2 feet ceilings with a large drop-down projector screen.

A permanent station in which the computer and peripheral equipment is secured in appropriate cabinets to be accessible conveniently to the authorized user.

- Proper facilities for the lecturer to sit in an elevated position facing the students and for projection of the contents of the screen on his computer on the projector screen.
- Coordination among the faculty so that the diversity of softwares used are kept at the minimum.
- Appropriate design of students seating facilities so that those who wish to use their lap-tops in the classroom can do so conveniently.

Lighting should be controllable so that it may be adjusted to allow the projected material to be seen comfortably while there is sufficient light for the students to take notes or see the keyboard of their lap-tops.

- It is important to persuade students in investing in computer facilities early in their college training, so that they can use their computer skills in study, research, and termpaper preparation, and be able to interact with the instructor effectively.

References

Lotka, A. J. *Elements of Mathematical Biology.* New York: Dover, 1956. Previously published in 1925 under *Elements of Physical Biology.*

Blaug, M. *Economic Theory in Retrospect.* Homewood, Illinois: Richard Irwin, 1962.

Teaching Economics: Some Information From The Marketplace

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Introduction

What should be taught in an undergraduate economics program? Three major reports published since World War II (Taylor 1950; Siegfried and Wilkinson 1982; Siegfried et al 1991) addressed this and related questions. Numerous educators, e.g. Hansen 1986, have given their own answers. These reports and answers, however thoughtful, are flawed. The flaw is that very little information from the marketplace has been used in deciding what should be taught. This paper develops the rationale for using market information provided by alumni in designing the economics major. The main purpose of the paper, however, is to report and interpret what the alumni who majored in economics at the University of Wisconsin-Eau Claire have told us about themselves, the economics major and what should be taught in an economics program.

We begin by explaining why the alumni survey is an important but overlooked source of information for teachers. Next, we describe the survey. The major part of the paper, the survey results, comes next. As is usual, the paper ends with the conclusions.

The Alumni Survey: A Theoretical Perspective

Surveying alumni may need no justification beyond the fact that it is interesting for economics teachers to find out what former students have to say about the major. It is fascinating stuff. A recent article (Becker 1991) that laid out a research agenda for economic education suggested that alumni surveys could, among other things, identify the features of the economics major that departments should emphasize.

The fact that the results of alumni surveys are interesting and shed light on a topic identified as an important research topic is sufficient justification for doing an alumni survey and reporting the results. However, we think there is another deeper reason for doing alumni surveys. That reason was identified by David Colander (Colander 1991) in "Economists Don't Teach Students What They Need to Know." Colander was writing about graduate education in economics but his analysis applies equally to undergraduate economics education. Academic economists, like everybody else, tend to act in their own self-interest. Publishing, getting tenure and consulting are high on the list of what is in a faculty member's self-interest. Teaching what students need to know is lower on the list. There is little incentive for faculty members to identify what it is that undergraduate majors need to know. We simply assume that our perception of what students need is correct and proceed from there.

The fact is that most undergraduate economics majors do not become economists. The experience of the faculty provides information on what is important in economics for economists. There are few opportunities for the faculty to directly identify what is important about economics for graduates whose careers are outside of economics. Furthermore, there is no market or other mechanism that automatically transmits that information to the faculty. That information must be acquired indirectly through mechanisms such as the alumni survey.

The Alumni Survey

Since 1955 when the first economics major graduated from UW-Eau Claire, 862 people have completed the program. The University had addresses for 653 of these people. In February 1993, questionnaires were sent to the 630 who had domestic addresses[1]. Two hundred and eighty questionnaires were returned.

Does the information and opinions garnered from the 280 respondents represent the narrow population of all UW-Eau Claire economics majors? Does the information and opinions represent the larger population of all economics majors? There is no way to know the answers to these questions with certainty. There are data that give us some confidence in an affirmative answer to the first question. Tables 1-3 show that the graduation dates and gender of the respondents match reasonably well with those of all UW-Eau Claire economics majors while the mix of degrees earned by the respondents is more heavily weighted toward the business track[2].

Table 1

Graduation Dates: All UWEC Economics Majors vs Respondents*

Graduation Date	Percent of All Majors (n=862)	Percent of Respondents (n=280)
1990 +	15%	16%
1985 - 89	21	25
1980 - 84	15	16
1975 - 79	12	10
1970 - 74	12	10
1965 - 69	8	8
1960 - 64	9	10
1955 - 59	7	5

* Due to cost and time considerations, the survey was not sent to 23 majors with foreign addresses.

Table 2

Degree Program: All UWEC Economics Majors vs Respondents

Degree Program	Percent of All Majors (n=862)	Percent of Respondents (n=275)*
Liberal Arts	65%	57%
Business	33	42
Education	2	1

* Two hundred and eighty alumni returned surveys but only two hundred and seventy five responded to the question on their degree program.

Gender: All UWEC Economics Majors vs Respondents

Gender	Percent of All Majors (n=862)	Percent of Respondents (n=278)*
Female	19%	18%
Male	81	82

* Two hundred and eighty alumni returned surveys but only two hundred and seventy eight responded to the question on gender.

Findings

Skill Development and Mastery of Content

Few things are dearer to the heart of an economics professor than the subject we teach. Small wonder we should want our students to master the intricacies of economics as we have. But is mastery of content what we should emphasize? Mastering content at the undergraduate level is clearly important for those students who go on to graduate school, but those students are a small fraction of the 30,000 students who graduate each year with an economics major.

Another change that occurs as a student proceeds through an economics major is that he or she develops skills in analytical thinking, research, writing, etc. Perhaps what is most important about the economics major is the development of these skills. Familiarity with content may diminish for those students who do not become professional economists while developed skills may endure.

Mastery of content and the development of skills are not mutually exclusive. Skill development enhances mastery of content and vice versa. Thus, the important question is which to emphasize. In order to get an understanding of the relative long-term value of these two aspects of the economics major, alumni were asked in one question to rate the importance of mastery of content and were asked in another question to rate the importance of skill development. Responses were coded so that responses in the "extremely important" category were assigned the number five, responses in the "very important" category were assigned the number four, etc. A mean score was then constructed for each question.

Table 4 shows the distribution of responses to the questions asking for a rating of importance of skill development and content. The mean score for skill development was 4.34 and for mastery of content was 3.61. The alumni's responses indicate that they believe the development of skills is more important than mastery of content.

Table 4
Skill Development vs Mastery of Content

Category Ranked	For Skill Development	For Mastery of Content
1. Extremely important	48%	13%
2. Very important	38	39
3. Important	13	45
4. Of little importance	1	3
5. Of no importance	0	0
Mean score	4.34	3.61

Given the finding from the survey that skill development is relatively more important, which skills should be emphasized? In order to answer this question, the alumni were asked to indicate the importance of five different skills. Table 5 contains the distribution of responses for the different skills and the mean score for each skill. Based on these responses, it appears that the faculty should emphasize the development of analytical thinking skills, speaking skills and writing skills.

Table 5
The Ranking of Different Kinds of Skills

Category Ranked	Analytical Skills	Writing Skills	Math Skills	Research Skills	Speaking Skills
1. Extremely imp.	47%	43%	16%	8%	48%
2. Very important	39	38	32	30	34
3. Important	14	18	46	49	15
4. Little importance	0	0	5	13	0
5. Of no importance	0	0	0	0	0
Mean score	4.32	4.24	3.60	3.33	4.32

While skill development had a higher ranking than mastery of content, learning the content of economics is obviously a critical part of the major. Which subject areas were most important in our alumni's experience? The alumni were asked to rate the importance of different subject areas. Table 6 contains the mean scores for different subject areas which were computed in the same manner as the scores for different skills.

One reassuring result from Table 6 is that three subject areas required for economics majors at UW-Eau Claire - microeconomics, macroeconomics, money and banking - were the highest rated subject areas. If these subjects were not highly rated, requiring students to master this content could be questioned.

Table 6

Table 6
The Importance of Different Subject Areas

Subject[a]	Mean[b] Score	Subject	Mean Score
Comparative Systems	3.17	Labor Economics	3.42
Econometrics	3.17	Macroeconomics	4.05
Economic Development	3.42	Managerial Economics	3.77
Environmental	3.16	Mathematical Econ	3.35
Industrial Organization	3.31	Microeconomics	4.01
Health Economics	3.06	Money and Banking	3.99
History of Thought	3.10	Public Finance	3.60
Investments	3.91	Urban Economics	3.21

[a] International economics was inadvertently omitted from the list of subjects.

Requirements For Economics Majors

One of the more spirited issues in economics departments these days is that of the appropriate mathematics requirements for majors. Many faculty believe that students should have an extensive mathematics background so that concepts such as marginal cost and multipliers can be explained more efficiently and effectively. The growing importance of mathematics for success in graduate school is also cited as a reason to increase mathematics requirements.

The alumni were asked what they think are the appropriate mathematics requirements for an economics major. Their responses are tabulated in Table 7. Although the alumni's answers were diverse, they center on one and two semesters of calculus. The responses of liberal arts majors to this question are more dispersed than the response of business majors. Seventeen percent of liberal arts majors advocate either mathematics minors or majors while the corresponding figure for business majors is only 6 percent. On the other hand, 23 percent of liberal arts majors believe arithmetic or algebra is sufficient while only 19 percent of business majors think this would be sufficient. Perhaps the greater variety in occupations of liberal arts majors explains the greater variance in their indicated need for mathematical skill.

Table 7

What Level of Mathematics is Appropriate for an Economics Major?

Math Level	All Majors (n=278)*	Liberal Arts (n=154)	Business (n=115)	Education (n=4)
Arithmetic	3%	4%	3%	0
Algebra	18	19	16	50
1 semester calculus	38	38	40	0
2 semester calculus	23	16	33	25
Mathematics minor	14	14	6	25
Mathematics major	2	3	0	0
Other	4	6	3	0

* The number of alumni responding to this question (278) exceeds the total number responding by degree program (273) because 5 alumni did not respond to the question on their degree program.

Another way to analyze the mathematical requirement issue is to look at alumni responses to the mathematics requirements question by dividing the alumni according to highest degree earned. This is done in Table 8. The table indicates that alumni with advanced degrees support somewhat higher mathematics requirements than those with only an undergraduate degree but the difference is rather small. Alumni with Ph.D's advocate the highest mathematics requirements.

Table 8

Response to Mathematics Requirement Question by Highest Degree Earned

Math Level	Undergraduate Only (n=178)	Some Advanced Degree (n=97)	MBA (n=34)	PhD (n=6)
Arithmetic	3%	3%	0	0
Algebra	20	14	15	0
1 semester of calculus	39	37	44	0
2 semesters of calculus	22	26	32	50
Mathematics minor	12	8	3	17
Mathematics major	1	2	0	17
Other	1	9	7	17

Alumni were also asked about statistics requirements for economics majors. Table 9 shows that while 38% of the respondents believe one statistics class is sufficient, the rest believe more statistics are needed. This view is shared almost equally by liberal arts and business majors.

Table 9

Table 9

Appropriate Statistics Requirement for an Economics Major

Statistics Level	All majors (n=278)*	Liberal Arts(n=155)	Business (n=114)	Education (n=4)
Basic Statistics	38%	38%	38%	75%
Basic Statistics plus Econometrics	44	42	47	25
Econometrics plus Advanced Statistics	16	18	14	0
Other	1	2	0	0

* The number of alumni responding to this question (278) exceeds the total number responding by degree program (273) because 5 alumni did not respond to the question on their degree program.

One requirement for the major that UWEC Department of Economics has discussed and that some economics departments have is that of a "capstone experience". While this term is somewhat vague, it presumably involves students integrating their knowledge in a research project and presenting results. Recent literature in economic education (Siegfried et al. 1991) gives support to a capstone experience requirement. Another reason for requiring a capstone experience for economics majors is the increasing concern with assessing the educational experience of students. A capstone experience is one way for departments to demonstrate that their students have developed certain skills and an understanding of the subject.

Alumni were asked if the UWEC economics major should include a capstone experience. Their responses presented in Table 10 indicate reasonably strong alumni support for such a requirement. Fifty-eight percent answered "yes", 17 percent answered "no" and 25 percent answered "undecided". Those who were undecided often indicated that they needed to know more about what the capstone experience entailed.

Table 10

Should the Economics Major Include a Capstone Experience?

Response	Percent (n=277)
Yes	58%
No	17
Undecided	25

Two semesters of introductory accounting are required for the economics major in the School of Business. There are no accounting requirements for majors in the School of Arts and Sciences. The two introductory accounting classes are included in a group of classes, two of which can be counted as credit for the liberal arts economics major. There are no accounting requirements for economics majors in the School of Education.

Does this treatment of accounting classes make sense? The answer to that question depends, in part, on whether or not a knowledge of accounting is important to our majors. Table 11 shows that when alumni were asked to rate how important an understanding of accounting was to them, 81% indicated that accounting was either extremely important, very important or important.

Table 11
Importance of Accounting

Response	All Majors (n=279)*	Liberal Arts(n=155)	Business (n=115)	Education (n=4)
Extremely important	23%	19%	28%	0%
Very important	29	28	30	25
Important	29	28	31	50
Of little importance	16	21	11	25
Of no importance	2	4	0	0

* The number of alumni responding to this question (279) exceeds the total number responding by degree program (274) because 5 alumni did not respond to the question on their degree program.

Comprehensive (business) economics majors, as one would expect, rated accounting as more important than liberal arts majors. Nonetheless, 75% of liberal arts majors rated accounting as either extremely important, very important or important. The small number of responses from the School of Education majors make it difficult to draw a conclusion on the importance of accounting to these majors.

Ocupational, Educational and Economic Characteristics of the Respondents

One reason for surveying the alumni was simply to learn more about them. Knowing their occupations, educational achievements and economic characteristics can help the faculty redefine the economics programs and courses. Data on the alumni can help the faculty answer questions posed by current students such as: What can I do with an economics major? Do most majors go to graduate school? How much can I expect to earn?

Tables 12 through 15, derived from the survey, contain some interesting information about our alumni. Thirty-six percent have degrees beyond their undergraduate degree, eighty-five percent are employed full-time, three percent are employed part-time, one percent are unemployed, and four percent are retired. Most alumni work in the private sector and most are doing well economically. The most commonly selected occupational earnings range was $30,000 - $40,000. Fifty-six percent make more than $40,000 and five percent make more than $150,000.

Table 12
Respondents by Degrees Earned

Degree Earned	Percent of Respondents (n-277)
Undergraduate only	64%
MBA	12
MA or MS	12
JD or LLB	6
Ph.D. or ED	2
Other	2

Table 13
Respondents by Employment Status

Employment Status	Percent Respondents (n=277)
Employed - full-time	85%
Employed - part-time	3
Unemployed - looking for full-time work	1
Unemployed - looking for part-time work	0
Retired	4
Student	3
Other	3

Table 14
Respondents by Occupational Earnings

Earnings	Percent Respondents (n=260)
$ 0 - 10,000	2%
10 - 20,000	9
20 - 30,000	14
30 - 40,000	20
40 - 50,000	12
50 - 60,000	13
60 - 70,000	7
70 - 80,000	5
80 - 90,000	5
90 - 100,000	4
100 - 150,000	5
150,000 +	5

Alumni were also asked to identify their usual occupation. Each response was allocated to one of 17 related categories. The categories were defined to approximate sets of interests and skills. The list of occupational categories, alumni distribution by occupation and mean income by occupation are provided in Table 15.

A remarkable item of information from the occupation question is that only one respondent self-identified himself as an economist. Perhaps the six respondents who indicated teaching at the college level as an occupation could be considered "economists" although two did not specify field and one specified mathematics. Several of the 11 who identified themselves as students may also become professional economists. But even if we accept a generous definition of "economist", at the undergraduate level, we clearly do not train people to become professional economists.

Almost one-third of the respondents identified their occupations as some type of management. Another fifth of the respondents identified their occupations as related to marketing. Combined, marketing and management account for more than half of those who identified an occupation. The implication of these results is that, at the undergraduate level, we train students in economics to go into a wide array of occupations.

The pattern of earnings levels are about as expected although the mean seems a bit high. There may be an upward bias because successful people are more likely to respond to the survey or some respondents may have reported family income rather than own earnings. The highest earning occupation is law. The lowest earning occupation by some margin is elementary/secondary teaching.

Table 15
Alumni Occupations and Earnings

Occupations	Count	Percent	Mean Earnings*
11 Manager-Finance	37	13.2	$44,189
12 Manager-Private	44	15.7	53,780(3)
13 Manager-Public	8	2.9	60,000
Group Total	89	31.8	
21 Economist	1	0.4	45,000
22 Auditor/Accountant	30	10.7	44,600(1)
Group Total	31	11.1	
31 Student	11	3.9	16,250
32 Teacher-College	6	2.1	55,000
33 Teacher-Elem/Sec	3	1.1	30,000
Group Total	20	7.1	
41 Law	16	5.7	65,000(3)
51 Insurance/Investments	38	13.6	58,714(3)
52 Real Estate/Appraiser	4	1.4	58,333
53 Sales-General	16	5.7	61,666(3)
Group Total	58	20.7	
61 Consultant	8	2.9	62,142
62 System Analyst	9	3.2	38,333
Group Total	17	6.1	
71 Self-employed	10	3.6	59,444
81 Retired	5	1.8	45,000
91 Other & No response	34	12.1	31,206
Total	280	100.0	49,129

* The means were calculated at the midpoints of the specified ranges. The numbers in parentheses are the responses in the unbounded range of $150,000+

The Open-Ended Questions

Six open-end questions were included in the survey. The advantage of this kind of question is that the alumni can explain what they are thinking. The disadvantage is that it is hard to fit answers into distinct categories. The bias of the reader can color the categorization and interpretation of answers. Keeping this in mind, what was learned from the alumni's response to open-ended questions?

The first question was: With reference to your economics major, what has been of most value to you? The most common answer was to name a specific class. The alumni's opinions about different classes were discussed in a previous section of this paper. For purposes of this section, the question became: In addition to what you learned in specific classes, what has been of most value to you?

The alumni described a wide variety of things as most valuable. Many were unique, but some themes did emerge. Four aspects of the economics major were repeatedly cited as most valuable. The aspect that was mentioned most often was the development of problem solving and decision making skills. Typical comments were:

"Economics taught me rational thinking..."

"I feel that it taught me to think in a logical and analytical manner."

"It allowed me to develop good analytical and problem solving skills which I was able to apply in a variety of jobs."

"The most valuable asset I took away from my economics degree is the problem solving/analytical skills."

The second most frequently identified valuable aspect of the economics major was what was referred to as basic theory. For example:

"Understanding economic fundamentals--supply and demand, breakeven, etc."

"Gaining a sound understanding of basic theory."

"Understanding general principles of economics..."

The economics major gives students a kit of basic conceptual tools they can apply to different situations. That aspect of the major was second on the list of things cited as most valuable.

An understanding of how the economy works was the third most frequently cited aspect of what was most valuable about the economics major. For example, the alumni wrote:

"Understanding how the economy works..."

"The ability to understand the U.S. economy..."

"The understanding of the economy and business in general."

The final aspect of the economics major that was mentioned as most valuable is quite different from the first three. This aspect has little to do with the subject of economics; it has to do with the student-faculty relationship. What many alumni said was that the personal interest, encouragement and advice of the faculty was the most valuable aspect of the major to them. Typical comments were:

"The friendship and relationships with professors."

"Relationships with professors. They were able to steer me in the right direction and I could trust them for advice and encouragement."

"A teacher or teachers that take special interest in you..."

The second open-ended question was: With reference to your economics major, what has been of least value to you? Most responses to this question involved the naming of a class or classes. Just about every class in the catalog was mentioned. History of Thought (17 citings), Econometrics (12), Mathematics (9) and Public Finance (8) were mentioned most frequently. In many cases when a class was cited as least valuable, a qualifier was often added. For example:

"From a practical point of view, courses such as the history of economic thought. However, I would argue that those courses be retained. Knowing where the discipline has come from may help get it back on the road to relevance."

"In my current occupation, econometrics is not of great value. However, it was very important in graduate school."

The third question, which generated the most varied replies, was: What should be included in the major that was not included? Three responses stood out. These responses in order of frequency were: 1. more mathematics (37); 2. more business and current events applications (27); 3. more emphasis on communication skills (23). More accounting and more computer usage were two other common responses.

The next open-ended question was: What should be the goals of the UW-Eau Claire Economics Department? This question was included, in part, because UW-Eau Claire is in the process of redefining all majors. Program Review and Educational Quality in the Major, one of the guides for this process, points out that strong programs have clearly articulated goals and that a statement of goals is necessary before program assessment. Rather than have the faculty unilaterally establish goals, it was decided that the question of goals should be posed to the alumni.

The most frequent alumni answer was that the goal should be to prepare students for their career. A number of alumni pointed out that different students have different career aspirations so the department needs to have different tracks to help students achieve those aspirations. What this answer tells us is that the alumni are very career conscious. They clearly want their education to improve their job prospects. What this answer does not tell us is how to prepare students for their careers.

Two other frequent answers were similar to each other. These answers were that the department's goal should be to develop the economic reasoning skills of students and to develop student skills in general. Other frequent answers were such things as: "teach basic concepts", "provide a well rounded education" and "prepare students for the future".

The final open-ended question was: What suggestions do you have for improving the UWEC Department of Economics? Alumni answers focused less on what we should require and focused more on what we should do. For example, the number one response was the department should improve career advising/guidance. Typical comments were:

"I would encourage the staff to take a more active role in advising students of post graduate career opportunities for economics majors..."

"Provide more individual guidance on employment opportunities."

"Better career planning and advising and post graduate placement or assistance."

The next three suggestions cited with about equal frequency were: improve student communication skills, use more group projects in classes and bring in more outside speakers. This last suggestion seems to have two different motivations. One is to use outside speakers as experts and the other is to use outside speakers to show what is possible with an economics major. The final group of suggestions for improvement included: integrate more computer usage into classes, require more mathematics, institute a capstone experience and provide more internships.

Conclusions

We believe that undergraduate economics education should be guided by market dictates to a larger extent than it currently is. The survey of economics majors who graduated from the University of Wisconsin-Eau Claire is an attempt to identify some of the attributes that the market values in an undergraduate economics major. Our interpretation of the survey data is that the market is telling us:

1. Development of occupation-related skills is more important than mastery of economic content.

2. Thinking, speaking and writing are the most valuable skills.

3. "Core" courses are more important than "topics" courses.

4. There are differences of opinion in the market regarding mathematics and statistics. This is evidenced by the fact that:

    a. A majority (62%) believe one semester of calculus is sufficient.

    b. A majority (60%) believe more than a basic statistics course should be required for the major.

    c. Econometrics was not a highly ranked subject area.

    d. The most frequent response (37) to the question of what else should be included in the major was "more mathematics".

5. There is broad support for a capstone experience.

6. Accounting is valuable but more important for business school economics majors than liberal arts or education majors.

7. Career advising, at least at UW-Eau Claire, needs to be improved.

8. Economics majors must be prepared for a wide variety of occupations. Management and marketing related occupations account for approximately one-half of majors while the professional economist category accounts for a very small proportion.

Our findings have implications for assessment. There is growing pressure for academic units to assess program outcomes. This pressure comes from accrediting bodies, governmental units and administration as well as from internal planning needs. Outcome assessment has perhaps been neglected in higher education because of a lack of agreement on what we are to assess. The information from the survey does not support the use of content exams for assessment. This type of exam will not tell us if an economics department is successful in providing what the marketplace values. More meaningful assessment devices must be explored.

Capstone projects have the capacity to both contribute to and assess skill development. A project which involves reasoning, writing and speaking could be rated by outside evaluators. Periodic surveys of alumni may also provide useful assessment information. The important element in assessment is that we assess achievement in areas such as those identified in this survey as having value to our students.

Footnotes

1. The 23 alumni with foreign addresses were omitted because of cost considerations.

2. The liberal arts program is 11 years older than the business program. The higher response rate for more recent graduates means that business economic majors will be more heavily represented among respondents than in the population.

References

Association of American Colleges. Program Review and Educational Quality in the Major: A Faculty Handbook, 1992.

Becker, William; Highsmith, Robert; Kennedy, Peter; and Walstad, William. "An Agenda for Research on Economic Education in Colleges and Universities." Journal of Economic Education 22 (Summer 1991): 241-50.

Colander, David. "Economists Don't Teach Students What They Need to Know." The Chronicle of Higher Education, November 13, 1991.

Colander, David. "Reform of Undergraduate Economics Education." In Educating Economists, pp. 231-241. Edited by David Colander and Reuven Brenner. Ann Arbor: The University of Michigan Press, 1992.

Hansen, W. Lee. "What Knowledge Is Most Worth Knowing - For Economics Majors?" The American Economic Review 76 (May 1986): 149-52.

Siegfried, John J. and J. T. Wilkinson. "The Economics Curriculum in the United States." The American Economic Review 72 (May 1982): 125-42.

Siegfried, John J.; Bartlett, R. L.; Hansen, W. L.; Kelley, A. C.; McCloskey, D. N.; Tietenberg, Thomas H. "The Status and Prospects of the Economics Major." Journal of Economic Education 22 (Summer 1991): 197-224.

Taylor, Horace. "The Teaching of Undergraduate Economics: Report of the Committee on the Undergraduate Teaching of Economics and Training of Economists." The American Economic Review 40 (December 1950):

Using the COMPENSTAT Assignment Generator

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The purpose of this paper and the accompanying demonstration is to share my experience in managing large, multiple sections of business and economics statistics classes using an assignment generator. Let me begin by mentioning a few things that computers have allowed me to accomplish, and a few things that computers should not be expected to accomplish.

Discussion will center around the CUP course ECON 222: Business and Economics Statistics II, a.k.a. "Stat 2." This course is taught by the Economics Department, which is organized within the College of Business Administration at Clarion. All business majors require the two-course sequence of all students during the sophomore year. Stat 2 begins with hypothesis testing of parameters (means and proportions), and continues through regression, ANOVA, Chi-square tests, some index numbers and some rank-order nonparametrics. The course is taught with an applied problem-solving emphasis, for the most part, rather than as theoretical statistics. Advanced research courses are offered in economics, marketing and management.

Computers Can and Can't

Over a decade ago, one of my papers reviewed the literature on this subject, in an effort to find the advantages and pitfalls of computer usage. Most of what the literature predicted then has been confirmed in my classroom or in that of my colleagues. In this paper, comments are confined to business and economics statistics, but many principles carry over into the teaching of other subjects, as well.

One thing that computer assignments cannot accomplish is the grounding of students in basics. Instructors often have expectations of students on the first day of class that are met in widely varying degrees by students in the class. In Stat 2, that means that students come from Stat 1 and the prerequisite mathematics courses with varying understanding of tools used for Stat 2. One effective way to deal with the variation in background is to do a review of several days, including handouts that summarize concepts that will be used in the current course. Review software, often released with texts might be used. Warning: don't fall into the trap of trying to reteach the preceding course, and don't start from too low of a level. A week should be the most time needed to assure that all students are together. More than three hours may indicate that you are covering subjects that aren't strictly necessary or in too much depth, while less than two days may mean that students will be lost through much of the course for lack of common ground.

Another thing that computers can't accomplish is the understanding of methodology, including statistical inference. Distillation of the method by the instructor, discussion with students and drill-and-practice are useful here. My students know my "Socratic" method as "applied terror" of solving problems in class by using correct tools, applying appropriate problem-solving methodology and coming to the best business decision or research implication.

As long as this doesn't degenerate into mindless arithmetic, students can learn to use the tools, as well as when to use the tools and why they should.

A third thing that computers can't do is to prevent "Black Box Syndrome." In fact, improperly used computers may foster the syndrome. The answer is not to ignore computers, but to use them correctly, realizing their strengths and weaknesses. Some end-of-chapter problems or worksheets at the beginning of the term and regular examinations throughout the term can assure that students understand the computations done by computer.

One thing that computers can do is to shift the emphasis from arithmetic to problem solving. Students can take less time in computation and more in setting up the problem and the interpretation of results. Instructors can spend less time with arithmetic and more on conclusions, as well. My own emphasis on application is better served by using a computer to give me arithmetic results, while spending more time on students' use of the statistical results.

A second thing that computers can do is allow the student to appreciate the entire problem-solving/research process. When working by hand, students may get an excellent view of each step of a process, but may miss the overall method, and how that method has much in common with other problem-solving methods. With a computer, a student can start with a question and some data, and work to an answer to the question in the time that it would take to do calculations from preliminary calculations by hand. This ties past material to the present material, and lets the student develop a generalized framework in which to set future material. Thus, the hypothesis about a mean relates to hypotheses about proportions, differences, multiple means, relationships and methods using nominal and ordinal data.

A third thing allowed by computers is drill-and-practice that is usually well received by students. While the purpose of a university course should not be vocational education, students usually enjoy the use of statistics software, communications software and word processing software (and other editors) during their work. In fact, they can do quite a number of assignments over the course of the term with little expenditure of time, and thereby cement concepts and processes. The instructor can also handle the greater number of assignments with less time at evaluation, leaving more time for student questions. My own experience went from long lines at my door before computerization, to longer lines with standard (i.e., bad) computer applications, to time for meaningful exchanges with students once computers were truly integrated into the course.

Using Assignment Generators

An assignment generator produces problems much like those at the end of text chapters: a problem is posed, and data is provided. The student is then expected to manipulate the data (by hand or by computer), come to a statistics conclusion, and answer the question posed. The difference from an end-of-chapter problem is that each student has a different set of data. Students can ask technical questions of each other without feeling dishonest, yet can't simply copy answers without working the problem. One might speculate that learning is enhanced through the interaction of students learning a problem-solving method. One can say with certainty that long lines of students with trivial mechanical problems no longer prevent the instructor from seeing students with subject-matter questions.

Another thing that an individualized assignment generator does is to provide answer sheets and keys to the assignments generated. The answer sheets are designed to encourage the student to arrange answers in a uniform way to aid evaluation. The keys, like the assignments, are individualized. A name at the top of an assignment might do something for a student's image, but certainly makes the matching of assignments to keys easy at evaluation time. There is no arithmetic necessary on the part of the instructor. The comparison of calculation results of answer sheet and key can be done at a glance, and hand corrections of answers is unnecessary since the key can be stapled to the answer sheet for return to the student. Time can the be spent on the part of the answer that computers can't do: the business implications of the statistical results, and how they help to answer the question posed.

My example is COMPENSTAT, first written by the author many years ago and updated several times since. Major changes are being made this Spring and Summer, in fact. While this genre of classroom aid is still rare, a few new titles surface from time to time. Unfortunately, most faculty do not know to ask for them, do not know their uses, and/or actively resist changing from the standard "go to the computer, punch in this stuff, get a printout, hand it in (what don't you understand?)" assignment.

An Example

The example used at the meetings is that of a difference in means. In my Stat 2 classes, this is typically the first assignment. By this time, my students have had their first exam, and have done such problems on the exam, in class and in end-of-chapter problems. It is the only assignment done after the exam on the subject matter for two reasons. First, this assignment is meant to be a confidence builder. Experience has shown that beginning with a simple problem that has a high success rate saves time, compared with beginning with, e.g., a multiple regression project. Second, students learn how to use computer resources to tackle a problem that they understand, but with enough data to demonstrate that computers can be useful tools. By concentrating on one thing at a time, they distinguish between the statistical method and the computer software and between an arithmetic aid and a "black box."

Distribution of the assignments may be done two ways: on paper or electronically. The demonstration is done on paper, since the participants probably don't have computer accounts at King's. This is the method that is used if a mail utility or computer account system is unavailable. When this was my only option, it required about five minutes of class time per assignment to hand out the assignments and answer sheets. However, it meant that students had to enter the data into a data set through the keyboard, which requires about 15 minutes. During the demonstration, this was not necessary, since data sets were typed onto the various disks already.

Since my Stat 2 students have class accounts, my "instructional" version of COMPENSTAT is now rigged to send assignments directly to student accounts on a DEC VAX computer, where the editor is used to create proper data sets. Students print off their own "hard copy" of their assignment and answer sheet from a line printer or from printers at a network or home microcomputer. Assignments take no more time than that required to tell students the name of the data file in which the assignment resides.

Computation may be done in any number of ways. My students usually use SAS software on the VAX, since the account structure allows me to "snoop" into their files if they have questions. They could probably do the problems by hand. The method used in the demonstration is that of a second "computational" version of COMPENSTAT that would normally be available to students. This may be the simplest package to use, and can do most computations used in a sophomore-level applied statistics course.

As shown by the assignment, answer key and answer sheet below, evaluation of the computational section of the problem is very simple, even though each student does a unique problem. Evaluation time of 2-3 seconds/student is needed to check if calculated answer and method of calculation are correct. Another second is sufficient to check hypotheses, another to check the decision rule, and another to check the statistical decision. Up to this point, most of the time has been spent on alphabetizing the answer sheets. At this point, the instructor can spend a second or a minute in the evaluation of the student's written answer to the question posed. Most instructors appreciate the ability to concentrate on this aspect of the assignment, since it is here that the student can demonstrate an understanding of the use of statistics in business problem solving or research.

Conclusion

My classes are sometimes large: up to 45 students per section in each of three sections, in addition to a section of another course. Under these conditions, many instructors find that the use of computer projects to be impossible or very limited. Needless to say, a single, complicated computer project often causes frustration among the students, who often learn that statistics and computers are something less than helpful in understanding the world around them. Indeed, that was the feedback that came to me when single term projects were assigned to Stat 2 students.

Now, my students typically do six computer-assisted assignments on differences between means, one-way ANOVA, two-way ANOVA, simple linear regression, simple curvilinear regression and Chi-square test of independence. They are then able (and often eager) to propose, gather data for, estimate and write a multiple regression term project. While this is a fairly ambitious journey of discovery for the student, only the term project requires substantial evaluation time. Students have a better understanding of the use of statistics and a better attitude about the course. My time spent shepherding students through the hazards of computers has fallen substantially, allowing me to spend more time with students on subject matter and in other academic pursuits.

EXAMPLE ASSIGNMENT AND KEY

Student: McCormickBaum Builders Problem Data

Use the following data on cement delivered to Baum Builders, successful local builders, to determine whether AXAX (X1) and ACME (X2) deliver the same amount of cement in their 500 lb. bags. Use an alpha of 5% to test.

The samples were drawn from populations of 900 deliveries.

X1	X2	X1	X2
517.8289	519.6403	517.5804	520.5138
518.0809	518.9087	518.0616	520.9983
518.6361	520.3642	517.4181	518.7206
519.212	520.3221	517.8498	520.98
517.611	520.1671	518.7521	519.6416
519.1493	519.2821	519.0273	521.0383
517.5148	520.4114	517.8876	518.0871
518.4929	520.9258	518.0897	518.3401
517.4971	518.2087	519.0339	520.4366
517.3409	519.1321	518.671	518.1769
518.1902	520.3413	518.6484	519.186
519.133	519.8174	518.6381	520.8857
518.3026	518.9345	517.2803	519.2441
517.9946	519.9835	518.6834	518.5213
518.7124	518.8781	518.9144	519.9797

Baum Builders Assignment Key Student: McCormick

HYPOTHESIS TEST OF TWO MEANS

SUMMARY STATISTICS:

Sum of X1	15548.23	Sum of X2	15590.07
Sample Size	30	Sample Size	30
Mean of X1	518.2744	Mean of X2	519.6689
Sum of Squares	10.55748	Sum of Squares	25.54236
VAR of X1	.3640509	VAR of X2	.880771
S of X1	.6033663	S of X2	.938494

Standard Error	.2037009
Degrees Freedom	60
alpha level	.05

The test statistic Z is-6.845675 for the hypothesized difference in means. The critical X-bar difference is-.3992538 for an alpha of .05. Therefore the difference in sample means, -1.39447, is reason to reject the null hypothesis.

The Impact of Two Curricular Changes on Student Achievement in Economic Principles: Some Evidence from an Open Admissions University

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University of Southern Indiana

1. Introduction

Student achievement in the principles of economics courses has always been a major concern of both teachers and students of economics. Possible reasons given for poor student performance are many and are widely documented in the economic education literature (Siegfried and Walstad, 1990 and Siegfried and Fels, 1979). Available solutions, on the other hand, may be quite limited, especially at an open admissions university such as the University of Southern Indiana (USI).

The mission of open admissions public universities is to provide equal access to higher education for all with a high school diploma or its equivalent. Equal access, however, is not the same as equal opportunity. While all who have graduated from high school may enter an open admissions university as freshmen, all entering freshmen do not face the same probability of success, as measured either by a passing grade in a course or by graduation with some degree. The student body at USI, for example, has the following profile of academic preparedness for college level work. The average SAT score is 850 (380 verbal and 470 math); about one-third of the students (32.7%) score below the college reading level on a DRP reading level test; and, around 8% enter with high school GPAs of less than 2.00 (on a 4.0 scale). These levels of academic prepardness pose obvious problems for both faculty and students across the entire college curriculum. In economics, for example, there is a well documented relationship between indicators of academic background, such as SAT scores, and performance measures, such as TUCE scores (see, for example, Siegfried and Waistad, 1990).

Many inputs may affect student achievement in any course. One suggested taxonomy is to classify these inputs into (1) student inputs and (2) institutional inputs (McConnell, 1990). Student inputs involve those attributes that the student brings to a class, such as academic background, socioeconomic background, human capital, age, gender, and motivation. Institutional inputs involve those phenomena that may be controlled by a college or individual instructor such as class size and teaching techniques.

Under circumstances where academic preparedness, a major student input, is inadequate some institutional inputs may have to be changed to increase students' probability of success. This paper examines the impact of two specific curricular changes on students' academic preparedness and their achievement in economics principles classes. The empirical question addressed here is: Did the implemented changes accomplish their purpose?

A major finding of our empirical analysis supports the commonly held notion that greater preparedness leads to greater achievement. By reducing the number of poorly prepared students taking economic principles, average achievement levels significantly improved. This outcome, however, is not uniform across all student subgroups. Specifically, improved performance was greatest among those with the least college experience as measured by total credit hours completed and those with the lowest college GPAS.

The remainder of this paper proceeds as follows: section 11 outlines the research design and describes the data analyzed; section III presents the empirical results; and, section IV offers some concluding comments.

II. Research Design

This paper's findings are based on data collected for all students enrolled in all sections of micro- and macroeconomic principles taught at USI during the regular semesters of a two-year period from Fall 1990 through Spring 1992. Data on two alternative measures of student achievement were collected. They are the pre- and post-test scores on the TUCE, and total earned class points as a percent of possible points (i.e., course grade). Data were also collected on a number of alternative measures of student preparedness for college level work. Those measures include verbal and math SAT scores, DRP reading test scores, high school and college GPAS, number of college credit hours earned, and whether the student was enrolled in his/her first college level economics class. Table 1 presents summary statistics of these variables across all four semesters studied.

Table 1
Measures of Student Academic Preparedness and Achievement
n = 855

Variable	Mean	Standard Deviation
GPA	2.62	0.71
Age	22.00	5.41
Sex (1=male)	0.51	0.50
Pre-Test TUCE score	9.92	3.43
Percent in First Econ. Class	0.55	0.50
DRP Reading Score	74.33	12.90
SAT Verbal	407.39	83.00
SAT Math	462.51	95.20
High School GPA	2.88	0.56
Course Grade	73.37	13.28
Post-Test TUCE score	12.53	4.63
TUCE Gain	2.64	4.65

Beginning in the Fall Semester 1991, micro- and macroeconomic principles at USI were renumbered from ECON102 (macro) and 103 (micro) to **ECON208** (micro) and 209 (macro),[1] and a prerequisite of college algebra was introduced. The renumbering of the two courses made them sophomore level classes, and the math prerequisite gave students important information about needed academic background (or, preparation). The timing of these curricular changes makes ft possible to divide our database into two two-semester periods, one prior to the curricular changes (n, = 484) and the other following those changes(n2 = 371).

Two hypotheses are tested here. The first states that the curricular changes adopted will significantly alter the level of students' academic preparedness. The second states that a higher level of academic preparedness will result in a greater level of achievement. To test these hypotheses, we compare students' preparedness and achievement before and after the curricular changes. Our data analyses include statistical tests of mean differences, and comparisons of frequency distributions, of various measures of both variables.

III. Empirical Results

(1) Changes in Student Academic Preparedness

The impact of the curricular changes on students' academic preparedness is presented in Table 2 below.

Table 2
Levels of Student Academic Preparedness

	Before		After		T-stat
Variable	Mean	Std. Dev.	Mean	Std. Dev.	
SAT Ver	412	80	400	86	1.56
SAT Math	454	92	473	99	2.17*
HSGPA	2.84	0.57	2.93	0.55	1.95*
DRP Reading	72.95	13.6	76.13	11.7	2.72**
Total Hours	33.82	26.3	43.15	28.0	5.00**
GPA	2.55	0.74	2.71	0.66	3.33**

* Significant at the 95% level
** Significant at the 99% level

As the table shows, the students who enrolled in our classes following the curricular changes were significantly better prepared for college level work on average than those who enrolled before the changes, based on every measure except the verbal portion of the SAT. SAT math scores increased by 20 points following the prerequisite change; high school GPAs were up almost 0.1 points; entering students' DRP reading scores on average were up over 3 points; college classroom experience increased by almost 10 semester hours; and, college GPAs increased by 0.16 points.

An examination of the frequency distributions of two preparedness measures reveals the disproportionate effects of our curricular changes across student subgroups. Table 3 presents the

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[1] See Bonello, Swartz and Davisson (1984) and Watts and Lynch (1989) for a discussion concerning the disadvantages faced by freshmen in principles of economics courses.

distributions of students by college GPAs before and after the curricular changes. A comparison of these distributions shows a large drop in the percentage of students with GPAs of 2.00 or less.

Table 3
Distribution Of Students by College GPA

	Before		After	
GPA Level	#	%	#	%
2.00 or less	108	21.9	51	13.7
2.01 - 2.50	123	25.5	89	24.0
2.51 - 3.00	121	25.1	106	28.6
3.01 - 3.50	83	17.2	77	20.8
3.51 - 4.00	50	10.4	48	12.9

Table 4 presents the distributions of students by class standing. The prerequisite of sophomore standing did not remove all freshmen from our principles classes , but it did substantiallydecreasethenumberoffirstsemesterfreshmenfrom33.1%to13.5%. Italso increased the proportion of sophomore students (32 - 62 credit hours) from 26.7% to 40.5%.

Table 4
Distribution of Students by Class Standing

	Before		After	
Total Hours	#	%	#	%
0 - 16	162	33.1	51	13.5
17 - 31	119	24.6	98	26.5
32 - 47	80	16.6	96	25.9
48 - 62	49	10.1	54	14.6
63 - 78	41	8.5	35	9.5
79 - 93	19	3.9	17	4.6
94 - 109	8	1.7	9	2.4
110+	7	1.4	11	3.0

(2) Changes in Student Achievement

The impact of our curricular changes on student achievement is presented in Table 5. Post test performance on the TUCE was almost two questions better (out of a possible 30), and the average pre to post test gain was 3 questions better. In addition, student average course grades increased by almost 5 percentage points from 71.3 to 76.0.

Table 5
Levels of Student Achievement

	Before		After		T-stat
Variable	Mean	Std. Dev.	Mean	Std. Dev.	
Post TUCE	11.68	4.2	13.55	4.9	5.84**
GRADE	71.3	14.8	76.0	10.5	5.33**
TUCE Gain	1.22	4.3	4.32	4.5	10.03**

* Significant at the 95% level
** Significant at the 99% level

A comparison of the distributions of students by course grade before and after our curricular changes shows a substantial decrease in the number of students receiving a failing grade (6.5% compared to 18%) and a less dramatic increase in the number of students receiving a grade of B (33.2% compared to 22.7%). (See Table 6.) Our data offer no explanations for the marked increase in the number of Bs earned, but they do provide some insight into two possible reasons for the decline in the number of failing grades received.

Table 6
Distribution of Students by Course Grade

	Before		After	
Percent Grades	#	%	#	%
Less than 60 (F)	88	18.0	24	6.5
60 - 69 (D)	105	21.7	75	20.2
70 - 79 (C)	139	28.7	120	32.3
80 - 89 (B)	110	22.7	123	33.2
90 - 1 00 (A)	43	8.9	29	7.8

Table 7 presents two distributions of student course grades on average by levels of college GPA. Mean grade differences for each GPA level show significantly greater achievement following the curricular changes among students with GPAs of 2.50 or less in their prior college coursework and no significant performance gain or loss among students with GPAs of more than 2.50. Students with GPAs of 2.00 or less received a course grade of F on average before the curricular changes and a grade of D on average after the changes. These findings together with those reported in Table 3 show that our curricular changes greatly reduced the number of students with sub-standard college GPAs who enrolled in our principles classes and even among those who did, achievement levels increased significantly, due perhaps to more college coursework experience.

Table 7
Course Grades by Level of College GPA

	Average Grade (GPA points)				
	Before		After		T-stat
GPA	Mean	Std. Dev.	Mean	Std. Dev.	
Less than 2.00	0.68	0.87	1.02	0.85	2.22*
2.01 - 2.50	1.39	1.00	1.74	0.97	2.48**
2.51 - 3.00	2.11	0.90	2.23	0.77	1.03
3.01 - 3.50	2.62	0.83	2.78	0.76	1.23
3.51 - 4.00	3.58	0.54	3.38	0.59	1.50

* Significant at the 95% level
** Significant at the 99% level

Table 8 presents two distributions of student course grades on average by class standing (based on credit hours completed). Mean grade differences for each class standing group show significantly greater achievement following the curricular changes for first and second semester freshmen and no significant performance gain or loss for all other groups. These findings together with those presented in Table 4 show that our curricular changes also greatly reduced the number of first semester freshmen who enrolled in our principles classes and even among those who did, achievement levels significantly increased, due perhaps to greater motivation and academic ability as measured by college GPA.

Table 8
Course Grades by Class Standing

	Before		After		
Total Hours	mean	std. dev.	mean	std. dev.	t-stat
0 - 16	1.51	1.18	2.26	1.05	4.03**
17 - 31	1.62	1.17	1.99	1.03	2.43*
32 - 47	2.15	1.09	2.08	1.01	0.42
48 - 62	2.14	1.21	2.11	0.98	0.15
63 - 78	2.05	1.32	2.06	1.11	0.03
79 - 93	2.31	1.11	2.53	0.87	0.64
94 - 109	2.75	1.28	2.78	0.83	0.05
110+	3.42	0.54	3.18	1.17	0.52

* Significant at the 95% level
** Significant at the 99% level

The findings presented in Tables 9 and 1 0 provide the remaining supporting evidence for our two hypotheses. Table 9 presents two distributions of mean college GPAs by class standing. Mean GPA differences for each class standing group show that the first semester freshmen who enrolled in our principles classes after our curricular changes had significantly higher average GPAs on prior college coursework than those first semester freshmen who enrolled in our principles classes before the curricular changes. Mean GPA differences for all other class standing groups are statistically insignificant. Table 10 presents two distributions of mean credit hours earned by level of college GPA. Mean credit hours earned for each GPA group are significantly greater following our curricular changes for the two lowest GPA groups only (i.e., those with GPAs of 2.50 or less). For all other groups, mean credit hour differences are statistically insignificant.

Table 9
College GPAs by Class Standing

	Before		After		
Total Hours	mean	std. dev.	mean	std. dev.	t-stat
0 - 16	2.31	0.83	2.72	0.70	3.23"
17 - 31	2.51	0.69	2.68	0.63	1.84
32 - 47	2.66	0.61	2.63	0.68	0.29
48 - 62	2.74	0.60	2.76	0.56	0.14
63 - 78	2.72	0.74	2.62	0.80	0.58
79 - 93	2.92	0.60	2.85	0.50	0.36
94 - 109	3.26	0.45	3.18	0.56	0.32
110+	3.34	0.49	3.11	0.74	0.74

* Significant at the 95% level
** Significant at the 99% level

Table 10
Completed College Credit Hours by Level of GPA

	Average Grade (GPA points)				
	Before			After	t-stat
GPA	Mean	Std. Dev.	Mean	Std. Dev.	
2.00 or less	21.84	16.7	39.14	24.5	5.18'*
2.01 - 2.50	31.67	22.1	40.65	24.6	2.78'
2.51 - 3.00	35.87	25.6	42.20	25.9	1.85
3.01 - 3.50	39.99	29.1	43.16	25.9	0.72
3.51 - 4.00	49.28	36.5	54.14	40.5	0.63

* Significant at the 95% level
** Significant at the 99% level

IV. CONCLUSIONS

In sum, the findings presented in Tables 3 and 4 show that our two curricular changes significantly altered, in two respects, the composition of the student body taking economics principles classes. Substantially fewer first semester freshmen and substantially fewer students with sub-standard college GPAs (2.00 or less) now enroll in micro and macro principles. Of course, some first and second semester freshmen and some students with relatively low college GPAs (2.50 or less) who otherwise meet the new course prerequisites do enroll in our principles classes, but as the findings presented in Tables 7 and 8 show these students' level of achievement as measured by their course grade on average is significantly greater now than before our curricular changes went into effect. Finally, the first semester freshmen who enroll in our principles classes now have significantly higher GPAs on prior college coursework than the first semester freshmen who enrolled in our classes before the curricular changes were implemented. (See Table 9.) And, the students with relatively low college GPAs who enroll in our principles clases now have significantly more experience with college level coursework than their counterparts did prior to the implementation of our new course prerequisites. (See Table 10.) Thus, the two groups of students most vulnerable to failing an economics principles class (namely, first semester freshmen and students with a history of little success in college) now come to our principles classes better prepared to meet the academic challenges which they present and, as a result, achieve more than their counterparts did before our two curricular changes were implemented.

Total Quality Management In The Classroom: A Production Experiment

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Total Quality Management (TQM) has ushered in a greater consciousness about production which should benefit our teaching of production theory. Specifically, TQM motivates managers to monitor production processes more carefully, to take responsibility for preventing breakdowns and the repetition of breakdowns, to encourage employees to think creatively about how to improve such processes, and to facilitate communication from employees that will engineer improvements. But how can these capacities be taught? This paper shows how a production experiment illustrates the principles of TQM while simultaneously providing a TQM answer to the problem of teaching production theory.

At the Robert Morris Annual Conference on Teaching Economics, we asked the question about how we currently motivate production theory in the classroom- at the Principles level, Micro/Macro level, and in Managerial Economics. As we went around the room, many different kinds of suggestions were provided:

- **CASE STUDIES:** One was the use of case studies. One member of the audience uses the automobile industry, which provides a historical perspective including the benefits of specialization (in assembly line production).
- **VISITING PRODUCTION FACILITIES**. Visits to manufacturing companies can be used to give a real world application of production, although there is problem of motivating the use of production functions to describe such complicated processes as well as logistical problems in coordinating the visits.
- **GUEST SPEAKERS**. Managers who are in charge of production processes may be able to provide perspective on the application of TQM as well as experiences with the management of production processes, but they will not be likely to use economic terminology or concepts unless they are former economics students. Sometimes, such presentations degenerate into war stories with shallow value.
- **HOMEWORK EXERCISES FROM THE MEDIA**. Homework exercises can be fashioned around Business Week, the Wall Street Journal, and other readily available publications. In fact some textbooks and instructor's manuals[1] have media exercises tailored to production theory.
- **CLASSROOM MEDIA EXERCISES**. If all students are required to subscribe to the same publication and bring the publication in on the same day, it may be possible to find articles that illustrate key production concepts and to read and discuss these articles in class. This requires some luck that the publication will have adequate articles at the time

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[1] Michael Tansey and Lawrence F. Ziegler. Instructor's Manual to accompany The Economy Today by Bradley R. Schiller, 6th edition, McGraw Hill; New York, 1994. Each of the 38 chapters contains a media exercise at the Principles level. Principles of production theory are illustrated with an exercise in chapter 20 (see Appendix I)

when production theory is being covered, but it can be a very effective way of motivating key concepts of production.

- **COMPUTER SIMULATIONS**. Although no one knew of any specific video or computer game that is designed to teach production, production functions are easily programmable. Furthermore, many games are characterized by limited resources and a certain goal that the gameplayer must achieve; this can often be used to motivate the concepts of production theory.
- **PRODUCTION EXPERIMENTS**. Several professors had examples of production experiments that they had tried. For example a production experiment with the folding of paper planes has been used to motivate diminishing marginal productivity and the learning curve. But it essentially involves only one resource (labor) and output which means that more sophisticated concepts such as substitutability and isoquants cannot be illustrated.

This last vehicle- production experiments- for motivating production theory is the subject of this paper. It has the advantage of integrating economic concepts with a real world application and some of the latest management concepts from the TQM movement.

I. EXPERIMENTAL DESIGN

A production experiment requires a simple production process which can be performed by a single individual, as well as a group of individuals. Simplicity and familiarity in the production process make the experiment much easier to run and to interpret. To test for the robustness of results with respect to at least two factors of production, it is useful to find a form of capital which can potentially complement or be substituted for labor in the production process. Several different production processes were tried including model assemblies, knots, and folding of paper shapes, but balloon blowing turned out to be the most attractive. The author has had nine years of experience using balloon blowing to illustrate the economic theory of production.

A. Pedagogy vs. Scientific Method

In designing a production experiment, certain inescapable tradeoffs will be found between the scientific method and pedagogical goals. These can be illustrated with respect to the balloon production experiment:

(1) **Maintaining interest vs. "ceteris paribus"**. Certain kinds of production experiments are easy to control- for example packaging pennies- but they are monumentally boring. On the other hand, some production experiments that are much more interesting such as the construction of toys involve incredible complications, large amounts of experimental time, and difficult quantification (nonhomogeneous output); almost inevitably they will violate the "ceteris paribus" assumption for a controlled experiment. Balloon blowing is a simple, homogeneous task that can be relatively well controlled in one-minute experiments.

(2) **Pedagogical goals vs. bias in results**. As production behaviors surface which illustrate key economic concepts, there is an irrepressible pedagogical desire to point them out.

However, since the students are also the experimental subjects, their newly acquired knowledge can bias their behavior and the experimental results.

(3) **Motivation vs. bias in results**. Students should have some idea about what to look for in an experiment. This can best be achieved by designing a presurvey (see Appendix I) which asks them to predict the outcome of the experiment. While such a specification of the hypotheses to be tested should be part of any scientific experiment, the guinea pigs of the experiment should not be the ones who fill it out; the experiment may be biased by the expectations and issues that are raised in the survey.

When pedagogical goals take precedence, the results of such production experiments are not models of the scientific method. They will reflect idiosyncrasies of the teacher's explanations and classroom techniques. Nevertheless the results may stimulate thinking about some very important truths about production. Most importantly the results can alert professors about what to expect to be able to illustrate using the experiment.

B. Setting Up the Experiment

In the balloon experiment, teams compete to maximize the average productivity of their members. There is no market place or market price to provide an incentive. No explicit, quantifiable motivation is provided to individuals or groups in the experiments reported here. They are given total uncertainty about the objective and had no problem motivating themselves.

The experiment has been set up into three stages. The first stage is to describe the experiment to the participants and to let them guess which combination of group sizes and capital will have the greatest productivity and will result in the greatest learning improvements (See results in Appendix I). The second stage is the actual experiment to see if these guesses are correct (See Table 2 below for these results). The third stage is to elicit from the participants their explanations of the contradictions between their expectations in the first stage and the experimental results (see Appendix II).

The setting of the experiments is a classroom. The participants in the experiment are students- executives, MBA Managerial Economics students, an undergraduate Managerial Economics class or Principles of Microeconomics class. In the experiment, hypotheses about production that were asked of the students in the pre-test (see Appendix I) are tested by comparing average balloon blowing productivity of group sizes of 1, 2, 4, and 8 people with complements of zero, one, or two helium canisters. When there are not enough students for each sized team, the teams are set up so that there are two multiple person teams (one team with a canister and one without), and the rest are one person teams.

Each group blows up as many balloons as possible over a one minute period and only full sized, tied balloons are tallied for all groups to see. The groups go up in two shifts to allow teams to rest and also to think (learn) over a ten minute period about how they might improve their performance.

The "*ceteris paribus*" assumption is difficult to control in this experiment. No correction has yet been tried for differences in the ages or status of the participants. No attempt is made to determine balloon blowing experience before the experiment; random selection of teams is assumed to be adequate to avoid any bias of the results. Different mixes of different sized groups compete with each other each time the experiment is run; there has been no attempt to control the number of groups in the competitive environment.

II. THE CONCEPTS ILLUSTRATED BY THE BALLOON EXPERIMENT

The specific economics course must determine which issues of TQM that a teacher wants to focus on, as well as the sophistication of the experiment. Of course the economic concepts that should be discussed will depend upon the specific economic class that is being taught. We will look at what comfortably can be done at five different levels of classes- Principles of Microeconomics class, upper level undergraduate Microeconomics, upper level undergraduate Managerial Economics, MBA Managerial Economics, and Executive MBA.

A. PRINCIPLES OF MICROECONOMICS.

With rarely more than 1 week being allocated to production theory in the Principles of Microeconomics, a professor can use the balloon experiment to provide practice in drawing total product and marginal product curves from production tables and illustrating the law of diminishing returns.

The first lecture is devoted to explanations of a production table, the presurvey (see Appendix I), the three trials, and recording of the balloon experiment. It is useful to record the data in the form of average productivity, as shown in Table 1, so that students can compare teams of different sizes and see which team is producing the most per person. This provides the motivation to do better which results in substantial improvement in later trials (see the results from experiments found in the author's classes in Table 1). It may also be possible to summarize at the end of the experiment what changes students saw that caused improvements in the results; this discussion can motivate the concepts of (a) "ceteris paribus" and (b) the impact of learning and technological change on productivity.

Table 1. Average Labor Productivity of Different Input Combinations.

# of Can-nis-ters	1st REPETITION # of people				2nd REPETITION # of people				3rd REPETITION # of people			
	1	2	4	8	1	2	4	8	1	2	4	8
0	4.2 25	3.6 30	3.7 17	3.5 15	5.5	4.3	4.6	4.2	5.8	4.9	5.2	5.3
1	3.4 19	2.6 10	2.8 11	1.9 8	4.7	3.8	3.7	3.6	5.0	4.7	4.3	4.1
2	-	3.0 3	-	2.3 6	-	3.2	-	3.5	-	5.0	-	4.4

*number of cases supervised by the author over a 9 year period is underlined for each cell (input combination).

From the data for the experiment, each of the students can be asked in the second lecture to draw a total product curve, average product curve, and marginal product curve corresponding to one of the rows or columns (specified by the teacher) in the production table. As the table is set up, there are 21 different possibilities that are available so that each student will have a different experience. Some students (those doing columns) will be discovering the negative marginal productivity of canisters, but increasing marginal productivity. Other students (those doing the rows) will discover positive but diminishing marginal productivity of labor. The whole period will be exhausted by drawing the curves, showing the relationships of marginal, average, and total product curves and by discussing the law of diminishing returns.

The third lecture provides the opportunity to integrate the textbook material and the experience with the experiment. Most Principles textbooks provide adequate coverage of production tables, the calculation of marginal product, and discussion of the law of diminishing returns.

B. UPPER LEVEL UNDERGRADUATE MICROECONOMICS

The topic coverage here should include production functions, isoquants, isocost curves, the marginal rate of technical substitution, increasing returns to scale, and the derivation of the cost schedule. This is a tall order for the 3 to six lectures that are typically devoted to the subject. However, the first two lectures can be designed to review the above material presented in Principles as well as isocosts followed by lectures to cover the following concepts:

(1) ISOCOST LINES (lecture 2). Have the students assume that one person minute costs $1.00 and 1 minute of helium canister use costs $1.00 (with no charge for the helium). Then the students should be able to calculate the cost of each combination of inputs that have been used in the experiment as shown in Table 2. From this information the students can be lead through the graphing of isocost lines. After labelling the isocost lines, the students should be shown that the lowest cost combinations of inputs occur closest to the origin.

Table 2. Costs of Different Combinations of Inputs

# of	Number of balloon blowers per minute				
canisters	0	1	2	4	8
0	0=$2*0+$1*0	1=$2*0+$1*1	2=$2*0+$1*2	4=$2*0+$1*4	8=$2*0+$1*8
1	2=$2*1+$1*0	3=$2*1+$1*1	4=$2*1+$1*2	6=$2*1+$1*4	10=$2*1+$1*8
2	4=$2*2+$1*0	5=$2*2+$1*1	6=$2*2+$1*2	8=$2*2+$1*4	12=$2*2+$1*8

It is preferable to use this tabular approach to graphing rather than the use of the linear cost equation so that the students receive the practice they will need to draw isoquants and see the parallelism between the two concepts.

(2) ISOQUANTS and RETURNS TO SCALE (lecture 3). The results from the experiment should be written down as a production table as in Table 3, which has been computed from Table 1. The rounding is necessary if the students are to use the data to graph isoquants.

Table 3. Total product of Different Input Combinations.

# of Canisters	1st REPETITION # of people				2nd REPETITION # of people				3rd REPETITION # of people			
	1	2	4	8	1	2	4	8	1	2	4	8
0	4	7	15	28	5	9	18	34	6	10	21	42
1	3	5	11	15	5	8	15	29	5	9	17	33
2	-	6	-	18	-	6	-	28	-	10	-	35

Each student can be given responsibility to graph a different isoquant representing anywhere from 5 to 20 balloons. Interpolation will have to be explained to them, and it may be useful to have them draw these isoquants in class so that it will be possible to walk around the room and help students who are having problems visualizing what must be done.

After labelling the isoquants, the students should be shown that the higher output combinations of inputs occur farther from the origin, the opposite from what happened with the isocost lines.

Returns to scale can be illustrated by comparing the spacing of the isoquants which represent multiples of a given level of output. For example, the students who drew isoquants for 5 balloons, 10 balloons, 15 balloons, and 20 balloons might be asked to draw their isoquants on the board. It can then be seen whether the isoquants moving further apart with higher output (decreasing returns to scale) or closer together (increasing returns). However there is a problem with this analysis...

The isoquants will be positively sloped. This provides the professor the opportunity to explain that such a phenomenon contradicts the normal assumptions about the shape of isoquants and the reasons why. Then the professor can ask the students to draw the isoquants in the second and third trials. With each new trial the "ceteris paribus" assumption is violated due to learning. The students should then be shown that there is greater shifting with canisters. They can be helped to draw where the isoquant is most likely to end up after learning has essentially been exhausted- let's call it the "ultimate" isoquant. The students can be shown the kind of production function that is associated with different possible shapes of this isoquant:

- A linear, negatively sloped isoquant indicates a linear production function.
- A curved, negative sloped isoquant indicates a multiplicative production function.

* A vertical (or horizontal) isoquant indicates a MIN() production function. Many texts will show that typically shaped isoquants loop around and that this experiment may be showing only a small segment of the actual isoquant under these specific experimental conditions.

(3) COST EFFECTIVENESS, EQUIMARGINALISM, and COST SCHEDULES (Fourth and Fifth lectures). The students can be shown that the absolute value of the slope of the ultimate isoquant is the marginal rate of technical substitution (MRTS). They can be introduced the concept of equimarginalism and the need for the MRTS to equal the ratio of the prices of the inputs at the optimal production rate. They can be then be introduced to the two types of studies:

(a) LEAST COST STUDIES. In least cost studies, the students must look for the least cost way to "get the job done." The job can be represented by a single isoquant. Students should superimpose the isocost lines from the second lecture onto their isoquant to find where the least cost point occurs (for each of the trials this will mean the first tangency occurs along an X-axis which corresponds to zero canisters).

(b) CONSTANT COST STUDIES. Now a single isocost line should be used. The students should see if their isoquants touch the isocost line. Find which student, whose isoquant touches the isocost line, has the isoquant representing the highest output. Indicate on the board where the optimal input combination occurs. It should also be along the X-axis as in the Least Cost study.

The students can be shown from the least cost data (in (a)) how to arrange the information into a cost schedule as shown in Table 4.

Table 4. Cost Schedule (based on Table 3 and Table 2 data)

Quantity of Balloons	Total Cost	Average Cost	Marginal Cost
0	$0	---	---
4	1	$.25	$.25
7	2	.29	.33
15	4	.27	.25
28	8	.29	.31

If this data is graphed, it is possible to reinforce the relationship between total, average, and marginal cost curves.

This material can usefully be summarized in a sixth lecture along with material from cost chapters of a Microeconomics text.

C. UPPER LEVEL UNDERGRADUATE MANAGERIAL ECONOMICS

Isoquants, isocost, and equimarginalism are not emphasized as heavily, while learning curves are more important in Managerial Economics courses. The students can be directed to go through Table 3, row-by-row, to find the cell which would provide a given level of output. After costing out each such cell, they can select the lowest cost way to produce the level of output, and then they can construct a cost schedule. The students prove much more adept at this intuitive approach than in the use of isoquants and isocosts and so more time can be spent on the total, average, and marginal cost curves.

Furthermore, more time is available with which to calculate and draw the learning curve. For example Table 5 shows the calculation of the data for the learning curve (as well as the information for presenting the data in logarithmic form) for two person teams that blow up balloons without canisters.

Table 5. Learning Curve Data

Trial Number	1	2	3
Output of balloons	7	9	10
Total cost of inputs	$2	2	2
Average cost of balloons	.285	.222	.200
LOGARITHMS OF			
Trial Number	0	.6931	1.0986
Average cost of balloons	-1.2528	-1.5040	-1.6094

The students can be shown the advantages of using logarithms, as well as learning the nature of the learning curve from this data.

Even more importantly graphs of the learning curve data in Table 5 can be juxtaposed to graphs of the average cost curves based on Table 4. Students can learn to distinguish changes in average costs over time (or, technically, with greater cumulative production) from changes in average costs with greater output at a given point in time. If average cost curves are computed for each trial, students can see that a movement along the learning curve corresponds to a downward shift of the average cost curve.

D. MBA MANAGERIAL ECONOMICS

While an MBA class should cover the same material as both the undergraduate managerial and microeconomic theory classes, professors are often faced with far less time, more heterogeneous classes, and exhausted night students. The experiment provides a good contrast to lecturing for delivering the material. The hands-on computation and graphing also keeps the students involved. If regression analysis is used in the class, a simple regression analysis to compute the best estimate of the learning curve may provide an excellent way to end the evening: students will actually be able to quantify their learning capability (even it's only about how to balloons rather than economics).

The logarithmic data in Table 5 can be used in simple linear regression to estimate a learning curve. The regression corresponding to Table 5 would be:

Log of average cost = -1.259 -.3287 * (log of number of trials)
(-62.33) (-12.2)

where the T-statistics are in parentheses and the R-squared is 99.3%. The three observations certainly raise questions about reliability- which must be explained to the students. But they make the problem very easy to calculate and allow the evening to be focused on the meaning of the learning curve rather than the technical problems of entering large amounts of data. This is almost a necessity if returns to scale, substitutability, and diminishing returns are also to be covered.

E. EXECUTIVE MBA ECONOMICS COURSE.

An Executive MBA course usually has an even greater time problem than a Managerial Economics course. Even more importantly, the course is likely to be multi-disciplinary focusing on production and recent management issues such as TQM. In such an environment, the experiment serves more as a point of departure for discussion, than as a bona fide experiment. As the executives do the experiment, TQM discoveries such as doing-it-right the first time, the importance of accountability, the intangible nature of incentives, the decrease in quality of production when the teacher focuses just on quantitative measures of output, etc. become evident and can be discussed. While such issues can be discussed in other classes, the executives are likely to be much quicker in recognizing the issues.

They also are likely to provide good insights and corroborative experiences (valuable for all of the other executives to hear) into various economic issues that explain the results of the experiments. Following are some of the questions that the author asks of the executives on the basis of the experiment:

"A. Explain the reasons for the results about the most efficient combination of capital and labor.
B. What types of tasks are teams best suited for? What types of tasks are individuals working alone best suited for?
C. What are the benefits and problems of automating?
D. What specifically can management do to ensure the most cost effective results are achieved in a production process? Name at least five dimensions of managerial control, each of which involves creativity or critical thinking.
E. For each of the dimensions in D. what attitudes or processes of thinking could interfere with a manager's ability to achieve cost effectiveness?
F. What concepts have you learned that would have allowed you to have made better technological predictions in the balloon experiment?"

Some of the answers to just the first question appear in Appendix II. The author has a similar compilation for each of the other questions.

Typically the executives have an ability to examine the results from the experiments and recognize the limits of the data in making generalizations. Nevertheless, it is easy to introduce them to the concepts of scientific method, "ceteris paribus", substitutability, returns to scale, diminishing returns, the learning curve, and technological change. They often use the concepts under other terms (sometimes incorrectly) such as "flexibility", "rules of thumb", "economies of scale" or "synergies", "redundant manpower", etc. They will provide insights into the source of such concepts.

III. EXPERIMENTAL RESULTS

The students are likely to be very interested in their failure on the presurvey. Typically the participants are clueless about the relationship of inputs to outputs. The presurvey in Appendix I tests how well participants are able to predict the results of the experiment. The participants in this experiment have great confidence in capital and teamwork. They are asked what combination of capital and labor will produce the greatest productivity. Over 85% of them trust in the maximum amount of capital and a moderate amount of labor (see question 1 in Appendix I). There is a definite skewness in favor of capital over labor (see question 1 and compare questions 2 and 3). None of them guess that the minimum amount of both labor and capital results in the greatest productivity (question 1).

The participants in the experiment also have great confidence in capital and teamwork with respect to learning. Over 60% believe that greater learning occurs when there is more capital. There is marginally less confidence that additional labor contributes to learning than there is that additional labor contributes to greater productivity at a given period of time (compare answers to question 3 and question 5 in Appendix I).

Finally the participants are believers in capital as the best way to achieve quality. Over 80% of the class believes better quality will be achieved with canisters than with hand blowing of balloons. They also are 2-to-1 believers that balloon blowing involves economies of scale and that people are easily replaced by canisters.

These presurvey results can be contrasted with the results of the second step of the experiment which have been shown above in Table 1. A single balloon blower has a statistically significant productivity advantage over several other group sizes. Even if counterintuitive, a self-reliant approach to the job is more productive than a cooperative effort. Furthermore, these experimental results show that capital initially has a negative influence on production. Nevertheless, after adjustments for the learning curve (larger groups with capital have faster learning curves), the students' predictions turn out to be more correct ultimately.

The results turn out only to be consistent- and only partially- with the participants' beliefs about learning and quality. In looking at a production process, the participants- whether undergraduate students or managers- do not anticipate the initial disadvantages of greater complexity introduced by more capital or labor. They may be anticipating the long run advantages of using greater amounts of capital and labor, but, in the case of labor, this experiment provides little evidence of such long run advantages. The experiment indicates a capital illusion and teamwork illusion rooted in the failure to anticipate or account for the increased complexities introduced by greater capital or teamwork.

IV. SUMMARY

Production experiments can motivate most of the concepts that are presented in production theory. Furthermore, the same production experiment can allow different points to be emphasized, depending upon the specific economic class that is being taught. The pedagogical purposes for the experiment may instill biases in the results. Some of the results will be counterintuitive. However, these biases and counterintuitive results actually provide opportunities for discussion that can make the theory much more clear to the students.

APPENDIX I.

NAME:______________________________ SEPTEMBER 10, 1990

HOMEWORK #2

I. PREDICTION SHEET: BALLOON EXPERIMENT (TURN IN SEP 22)

The balloon experiment will involve teams of 1, 2, 4, and 8 people. Some teams will have 2 helium canisters to blow up balloons, other teams will have only 1 helium canister, and the other teams will blow up balloons by hand. The number of balloons completely blown up and tied in one minute (without popping) are counted and the average number of balloons per person is computed for each team. Each team will have three trials in which to blow up balloons.

For the experiment, predict the answers to the following questions.

1. What size of team will be able to blow up the largest number of balloons per person (check one box below).

LARGEST NUMBER OF BALLOONS PER PERSON (Percentages)

Number of People	1	2	4	8
No Canisters	(0)	(4.9)	(0)	(2.4)
1 canister	(7.3)	(0)	(0)	(0)
2 canisters	(0)	(9.8)	(68.3)	(7.3)

2. In general, the teams that will be able to blow up the most balloons per person will have how many canisters?
(circle) 0 (2.2) 1 (23.9) 2 (73.9)

3. In general, what size of team will be able to blow up more balloons per person. (circle) 1 (8.9) 2 (15.6) 4 (46.7) 8 (28.9)

4. In general, the teams that will be able to improve their speed of blowing up balloons the most will have how many canisters? (circle) 0 (15.9) 1 (20.5) 2 (63.6)

5. In general, what size of team will be able to improve the speed of blowing up balloons the quickest? (circle)
1 (11.1) 2 (26.7) 4 (44.4) 8 (17.8)

6. In general, will teams with canisters provide higher quality balloons than those done by hand? (circle one)
YES (82.2) NO (17.8)

7. Are there economies of scale in balloon blowing?
YES (67.4) NO (32.6)

8. Can canisters substitute for people in any way in blowing up balloons? (circle one) YES (77.8) NO (22.2)

(HOW MANY OF THE EIGHT QUESTIONS ABOVE DID YOU CORRECTLY PREDICT):

_______ out of 8.

Appendix II. Anecdotal Reasons for the Results on Different Team Sizes.

In the competitive environment of the balloon experiment, one person teams are assumed to reflect the advantages of self reliance while multi-person teams reflect cooperation. With the participants in the experiment, it has proved useful to explore the reasons that cooperation had such a dampening effect on productivity and no apparent value to learning. By pinpointing the possible determinants of the productivity effect of increased cooperation, it may be possible to assess qualitatively how self reliance and cooperation affect productivity.

1. Benefits of Self Reliance

Generally there was surprise at the pervasive superiority of the one-man teams in blowing up balloons. In both written (see Appendix I) and verbal comments on the results, there was incredulity about the success of the one person teams. The comments that were made about the advantages of competition could roughly be categorized as follows:

- ACCOUNTABILITY. One person teams are accountable only to themselves. They are forced to think and act on every step of the process. In larger groups, cooperative effort creates problems of human interaction and follow through. Leadership, judgment, action, and performance monitoring are not required of all members. Some of these functions sometimes fall between the cracks.
- MORE CONSTRAINTS. The constraints on one man teams actually aid them to focus on what is needed to be done and helped them to eliminate experimentation. Larger teams have many more opportunities available for increasing productivity and lose productivity as they decide which choices to make or make poor choices.

  Multiple person teams can specialize between balloon blowing and balloon tying, but there is a problem in deciding who has the comparative advantage in which function, in determining the optimal number of people to do each function, and ultimately in choosing whether to specialize or not.

  Teams with canisters find even more complex problems to solve. Capital pulls the focus of the team. Usually two or three people intensely focus on how to use the canister while other members ignore what is happening or are ignored. Nevertheless, there is an attempt to use the canisters to blow up balloons for everyone on the team; balloon blowing becomes the constraint-apparently as a gesture of fairness. Few eight person teams (and never undergraduates) discover in the three repetitions that some people are surplus and better results may be achieved by allowing surplus members to blow up balloons by hand.

  In pilots of this experiment, string was made available to teams for tying the balloons. Although it was clearly inferior and they were told they could knot the balloons without string, most teams would use the string, much to the detriment of their productivity. Some large groups even specialized into blowers, string cutters, and knotters!

  Generally specialization and capital both introduce problems of matching knotters and blowers. Furthermore, capital requires learning a skill- to avoid popping balloons or making them too small.

The greater constraints on input management for the one man teams seem to be an important reason for their superior productivity.

- NO EXCESSIVE INDIVIDUAL BEHAVIORS. Unbridled creativity by a member of a team sometimes would be mentioned as a detriment to a large team's performance. A person who has stridently led the team down the wrong path would receive a kidding kind of blame. A person who is eager to beat the productivity record of one man teams might actually cause confusion or elicit mild noncooperation. Many of these behaviors can only exist from the interaction between members of the same team and therefore do not appear on one person teams.

- LESS DECISION MAKING AND LEADERSHIP PROBLEMS. There is no time spent in decision making for one person teams; those teams are quiet and spend all of their time working. Larger teams talk and strategize. Ambiguities of leadership produce spasmodic effort. Frivolous communication- from hysterics to the formation of cabals- occasionally impedes productivity. The single person team faces a less complex, less chaotic task.

- PEER PRESSURE. Subjects in one person teams were likely to comment on the peer pressure they feel. A low output would personally embarrass them. Individuals on multiple person teams- even on two person teams - almost never mention this peer pressure. The existence of even one extra person with whom to identify- or with whom to laugh off the result- greatly dissipates peer pressure.

- CONSTANT MONITORING. One person teams are in continual, intense awareness about their output as they work. Larger groups lose track of what they are doing and even where their output is. Often they have the impression that they have blown up more balloons than they in fact have while the one person teams know how many have been blown up at the moment the stop watch goes off.

- JOHN HENRY/ DAVID AND GOLIATH EFFECTS. There is a kind of John Henry effect- the desire to beat the machine- and David and Goliath effect- the desire to humble the large team- which seems to inspire one person teams to great effort. These effects provide a powerful, focused goal that motivates individuals. However, when asked what their goals are, members of larger teams tend to answer in terms of trying to eliminate bottlenecks, trying to improve coordination, etc. There is such a commitment to improving the process of production that the goal of blowing up balloons and winning is lost.

Having capital seems to mean that it must be used. At no time does a team with the availability of canisters ever ignore the canisters and choose to compete by blowing up balloons individually. Even teams without canisters are inclined to reject a procedure where everyone blows up and ties their own balloons; an attempt is usually made to specialize. Once committed to a process, the teams do not junk it in favor of a process that is proving more productive with one-person teams.

- PACING. Individuals in one person teams are often able to pace themselves, "develop a beat", "do it by the numbers", routinize the process, and generally feel a sense of control and confidence over the process. This means more uniform product (higher quality), higher productivity, and less wastage of balloons (less popping). For small groups this is achieved immediately. Very few groups with canisters learn to circle the canisters and methodically take turns blowing up the balloons. Pacing is much harder to establish and requires rapidly asserted leadership in the one or two large groups that develop it by the third repetition.

2. Benefits of Cooperation

The advantages of cooperation can be categorized as follows:

- SPECIALIZATION. Specialization promises to reap greater productivity gains as groups learn to separate the tying and blowing functions and to specialize according to their comparative advantages.
- TWO MINDS BETTER THAN ONE. More minds can come up with helpful hints about improvements that lead to greater learning effects. The learning effects come from small contributions (stretching balloons, noting surplus personnel, recognizing tying as the constraint, and comparative advantages of different individuals at tasks).
- SPIRIT AND RESILIENCE. When the larger teams see they are losing, people buck each other up and motivate the slow members of the group. The fast learning suggests a spirited resilience among the larger teams.
- SUSTAINED EFFORT. There is general agreement that a continuation of the experiment into more repetitions allows the larger groups to produce a more sustained effort. Specialization allows rotations over the most tiring parts of a job. People in one person groups generally agree that they have reached pretty close to their limit after the third repetition. Furthermore, larger groups enjoy the interaction with teammates which make the process itself much more interesting than for the individual balloon blowers. This allows them to hold their focus and sustain effort.
- FEWER CONSTRAINTS. With more opportunities for specializing and defining the production process, larger teams have more of a willingness to experiment. This experimentation would itself make a boring task less boring and more sustainable because it raises the level of interest in what is going on.

While human interaction is extremely costly in initial productivity, it does provide more ideas and options and faster learning. Even with as simple an output as balloon blowing, it is remarkable how many new alternative production processes open up with the addition of even one additional person to a team. While limiting a team to one member is extremely constraining, greater constraints may actually engender greater productivity.

An examination of this non-exhaustive list suggests that there is a profound discontinuity in the introduction of additional members to a single person team.

Such a discontinuity between one person teams and multi-person teams suggests a problem for using continuous measures of labor such as man hours or person minutes. Such continuous measures obscure whether more of the labor input occurs by adding people or by giving one person more time. However, the impact on a production process of the social-environmental changes from adding more workers can be the source of profound changes to productivity.

How Market Demand Determines Market Supply: A Computer-Animated Illustration

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INTRODUCTION

This paper provides background information on the computer-animated derivation of a market supply curve presented February 12, 1994 at Robert Morris College. The animation was developed as a joint project between David Thompson, a senior economic major at Marshall University and myself. I provided the theoretical framework for the presentation, and David developed the animation using a MacIntosh computer and a software program (Animation 1). There were several goals for this collaboration. First, I wanted David to become thoroughly familiar with the mathematical derivations and modelbuilding necessary to complete this project, because he has been thinking seriously about pursuing an advanced degree in economics. Second, I wanted to develop an animated illustration that explicitly shows the linkages between the graph of the market demand curve and the market supply curve to use in principles level classes. The purpose is to introduce principles students to the connection between market demand and the concept of opportunity cost. Finally, I wanted to develop a tool to simplify (and motivate) the use of algebraic models for intermediate level students. This is motivated in part by self interest since, if they are economics majors, I want to begin to prepare them for a required course in econometrics that I teach.

PRIMARY TEACHING CONCEPTS

The animation itself is designed to illustrate three concepts. First, it illustrates how a production possibilities' frontier can be derived from production functions and a resource constraint. Second, it emphasizes how the opportunity cost of any good or service depends on two factors: (1) the market demand for all other goods and services, and (2) the Marginal Rate of Product Transformation (MRPT) between the good in question and the alternatives sacrificed to for its production. Third, it provides an animated illustration of how competitive markets produce a welfare-maximizing allocation of resources.

Students often get the impression that market supply is established only by technological factors. Thus, the primary purpose of this illustration is to show that technological constraints comprise only one factor that determines the opportunity cost of supplying a good or service. The animation provides a clear and easily understood illustration of how the opportunity cost of any good or service also depends on the demand curves for alternate outputs.[1] This animation allows students to quickly grasp why it is that these demand curves provide an indispensable ingredient in market supply. It also allows students to see how markets simultaneously assesses the value of a resource in competing activities, and then allocates that resource to the most valuable activity.

ASSUMPTIONS AND FRAMEWORK OF THE MODEL

The computerized illustration begins by developing the resource and technological constraints of *Brewshift*, a country that produces only two goods--beer and motorcycles. *Brewshift* consists of a brewery, a motorcycle factory, and a labor force divided between the two activities. Since the capital stock (the brewery and the motorcycle factory) is fixed, the only way to alter output is to shift workers between the two employments. To simplify the algebra and the animation task, we assume beer production is characterized by constant marginal returns. We do allow for the more realistic situation of diminishing marginal returns in the production of motorcycles.[2]

While algebraic models of resource and technological constraints accompany the animated illustration, graphs provide the primary vehicle for illustrating relationships. For example, the labor constraint ($L_{beer} + L_{mc} = 100$), and the production functions for beer and motorcycles ($Q_b = L_b$, $Q_{mc} = L_{mc}^{1/2}$) are illustrated with graphs.

GRAPHICAL DERIVATION OF THE PPF

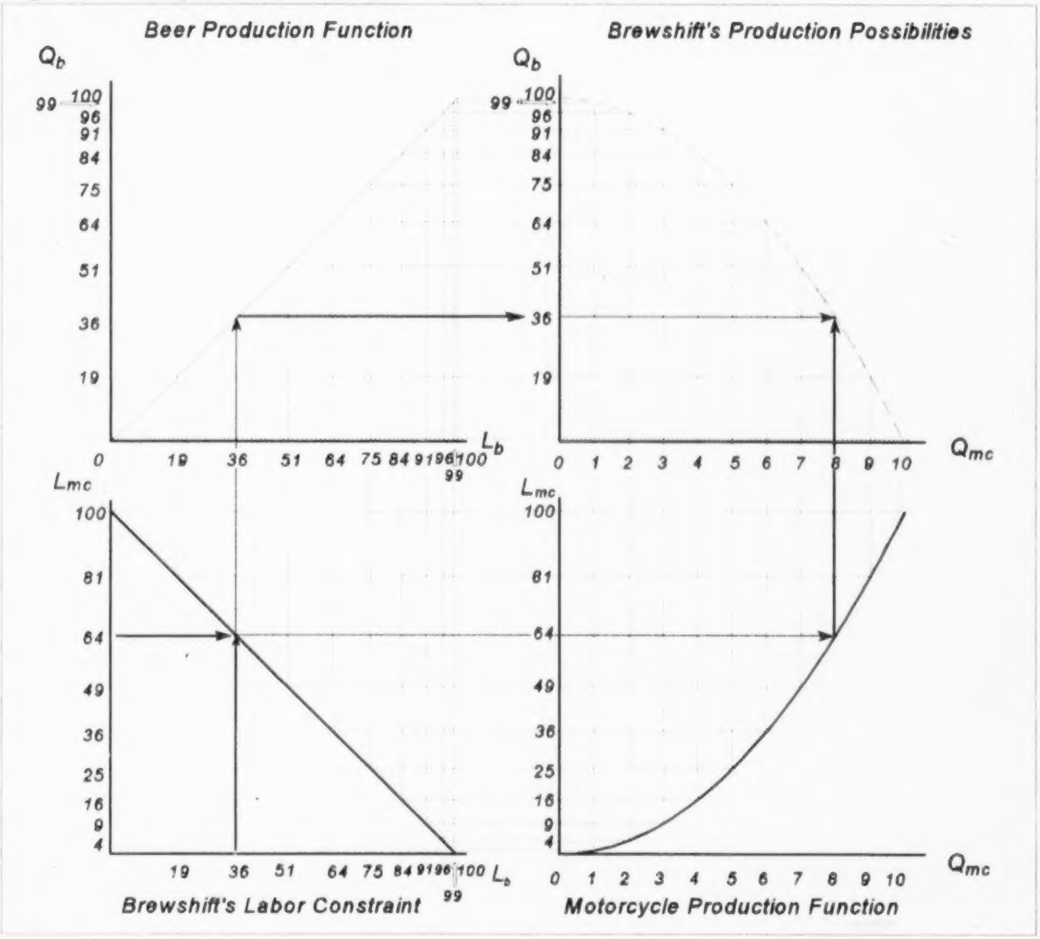
The animation begins with graphs of the two production functions and the labor constraint. In Figure 1 below, the axes if the graphs have been arranged so that information from one graph can be readily transferred to related graphs (analogous to the graphing technique used in the IS-LM model of macroeconomics). Beginning with one point on the labor constraint (e.g., 36 workers in the brewery and 64workers in the motorcycle factory), horizontal and vertical lines are extended to each short run production graph. This determines the amount of beer and motorcycles that can be produced, given the resource constraint and technology (36 barrels of beer and eight motorcycles). From there, we next extend vertical and horizontal lines to find one alternative on Brewshift's PPF. We then proceed to another point on the labor constraint and repeat the process.

By continuing this process in the animation, students have many opportunities to comprehend this derivation of the PPF. It allows students to see how the division of labor and the technological constraints embedded in the production functions enter this derivation. After the animated derivation of the PPF, students reproduce the results in a class handout.

THE ROLE OF TECHNOLOGY

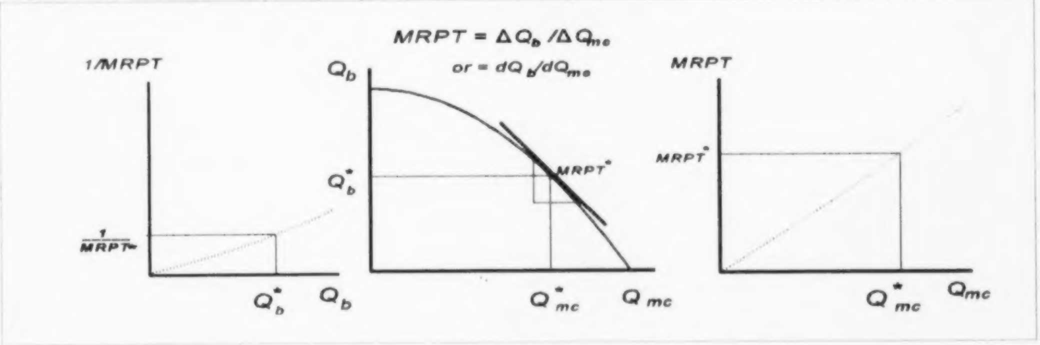
After deriving *Brewshift's* PPF, we develop the role of the MRPT in the opportunity cost of beer and motorcycles. This is effected by linking the MRPT to the (absolute value) slope of the PPF. We use this link to illustrate how a change in the MRPT records a change in input requirements per unit of output as we progress along the PPF. The animation begins at one corner of the PPF and, as it moves to the other, The

Figure 1: Graphical Derivation of Brewshift's PPF



MRPT is recorded for both goods (see Figure 2 below).

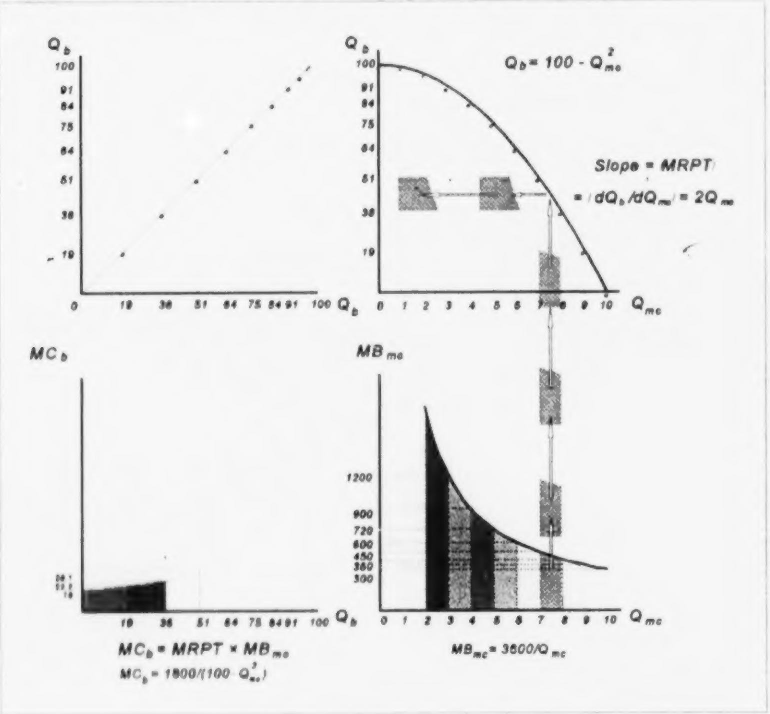
Figure 2: Marginal Rate of Product Transformation


$MRPT = \Delta Q_b / \Delta Q_{mc}$
or $= dQ_b/dQ_{mc}$
1/MRPT
$\frac{1}{MRPT}$
Q_b^*
Q_b
Q_b
Q_b^*
$MRPT^*$
Q_{mc}^*
Q_{mc}
MRPT
$MRPT^*$
Q_{mc}^*
Q_{mc}

As we move along *Brewshift's* PPF we relate changes in the MRPT (the absolutevalue of

Q_b/Q_{mc}) to alternate combinations of beer and motorcycles. In this part of the animation, we focus on the contribution that technology makes in determining the opportunity cost of supplying each good. The purpose of this step is to show that technological constraints do provide an "objective" element in the opportunity cost of producing either output. Technology does set the rate at which one product can be converted into the other (and consequently are not affected by changes in the demand curves for either beer or motorcycles). The "valuation" component is the next step added to the animation.

Figure 3: Value of Resources in forgone Output



ROLE OF MARKET VALUATIONS

In the valuation step, our animation adds demand curves for beer and motorcycles [3] and shows how they provide the other essential component to the derivation of a supply curve. The animation uses *Brewshift's* PPF, derived in the first step, and then adds the demand curves for each good. The demand curves provide the "valuation" or "prioritization" component to opportunity cost. Graphs used in this step of the animation are again arranged such that students can use the PPF and the demand curve for one good to derive the supply curve of the other product. The Graphical derivation is more complex, however, because the value of the resources used to expand production is established by their value in the next best alternative. While equations can be used to

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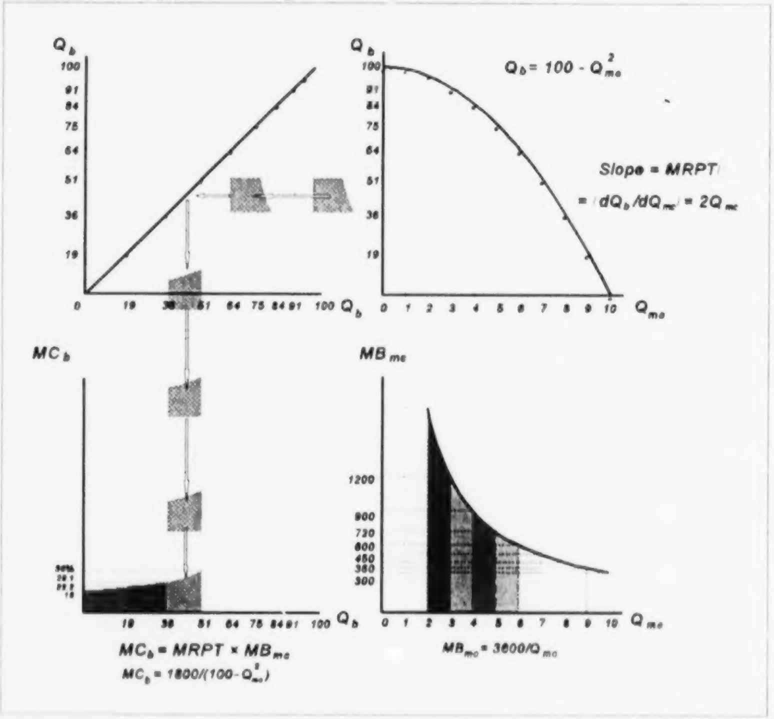
derive specific price-quantity combinations on the supply curves, they can (and should) be ignored if students do not have an adequate mathbackground to understand algebraic models. This step is illustrated and explained using two "snapshots" of the animation in Figure 3 and Figure 4 below.

Figure 4: Opportunity Cost of Resources

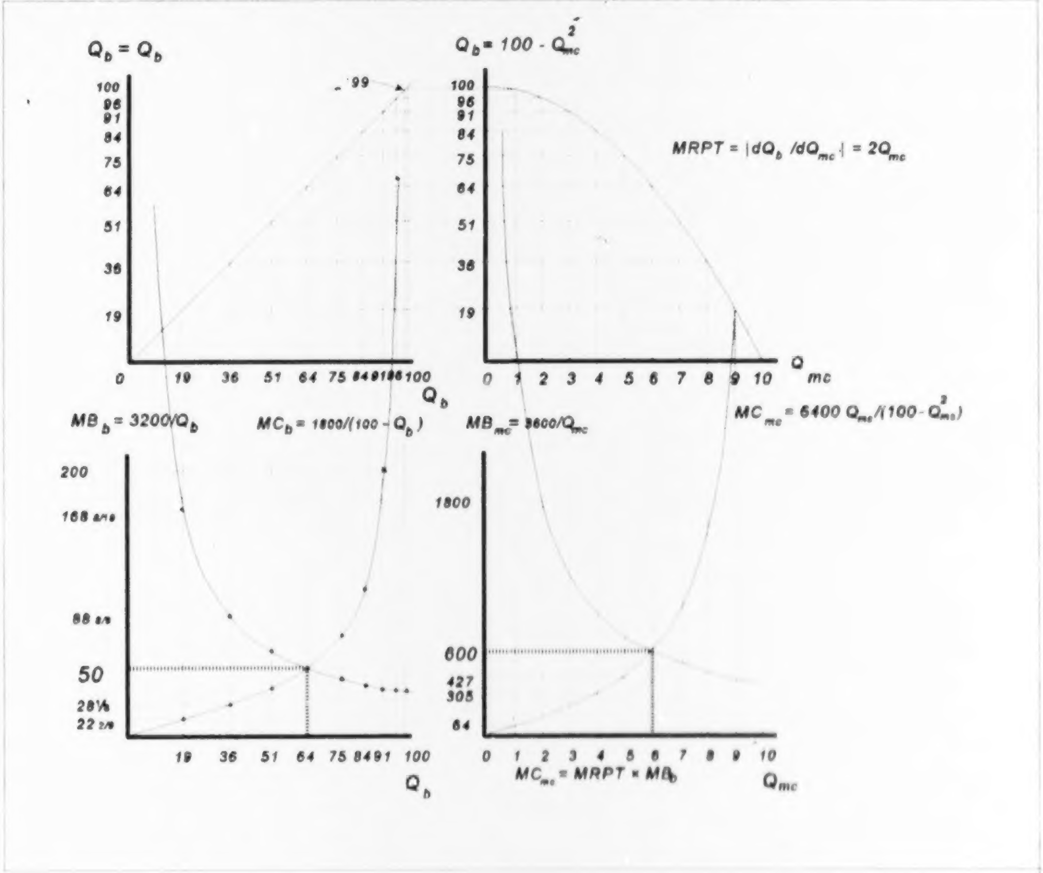


Alternate combinations of output on *Brewshift's* PPF are linked to corresponding points on the respective demand curves for beer and motorcycles. To emphasize the role of market demand establishing the opportunity cost of the alternative output, beer production is expanded (in Fig 3) from 36 to 51 barrels. Using the PPF (and the MRPT), we see how this expansion forces a reduction in motorcycle output from seven to six. Next, we use the demand curve for motorcycles to determine the opportunity cost of the seventh motorcycle (area under the dema curve between theseventh and eighth motorcycles). Visually, the area under the demand curve for the seventh motorcycle is converted into an area under the supply curve for barrels 36 thro 51 (see Figure 4). The animation continues with a unit-by-unit reduction of motorcycle outpu to determine the additional number of barrels of beer that can be produced. It is then used to illustrate how the MB of each motorcycle establishes the opportunity cost of the additional be The process is repeated using the demand curve for beer to derive the supply curve of motorcycles. By moving through alternative combinations on *Brewshift's* PPF, the animation allows students to see how both technology and market valuations ofalternative goods establis the opportunity cost of output.

MARKET EQUILIBRIUM AND RESOURCE ALLOCATION

In the final animation the separate derivations of the supply curves from their respective supply curves are superimposed in the same graph (Figure 5 below).

Figure 5: Equlibrium Combination of output in Brewshift



By proceeding along alternative production options illustrated by the PPF, students can see the value of resources in alternative uses, as well as their opportunity cost. Italso allows students to see that when markets achieve equilibrium, the total value of Brewshift's resources are maximized.

In addition, the models outlined here can be used to illustrate the impact of any parameter changes such as a technological advance, growth in the labor force, or change in demand. To maximize the benefit which students derive from each animation however, it is necessary to provide handouts and problem sets that reinforce the concepts covered.

Endnotes

1. Students have a great deal of difficulty understanding the connection between the supply curve of a good and the demand curve for other goods and services. We think they resist this idea because they come into economics believing that such things as wage rates are determined by "objective" costs (e.g., cost of education and training). Thus, they have trouble accepting that the opportunity cost of an input depends on the demand for other goods because, without algebraic models, this connection is neither obvious nor intuitive.

2. This simplification is particularly valuable if one wants to show how this derivation can be accomplished algebraically--after students see the animation--which may be a realistic objective in an honors section or in an intermediate level course.

3. The demand curves used in the example are unit elastic in order to assure that price changes in one market do not geneerate income effects which would spill over into the other market. This assumption is necessary because we have not included the factor market adjustments that would accompany such adjustments. This complication could only be eliminated within the framework of a general equilibrium model.

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